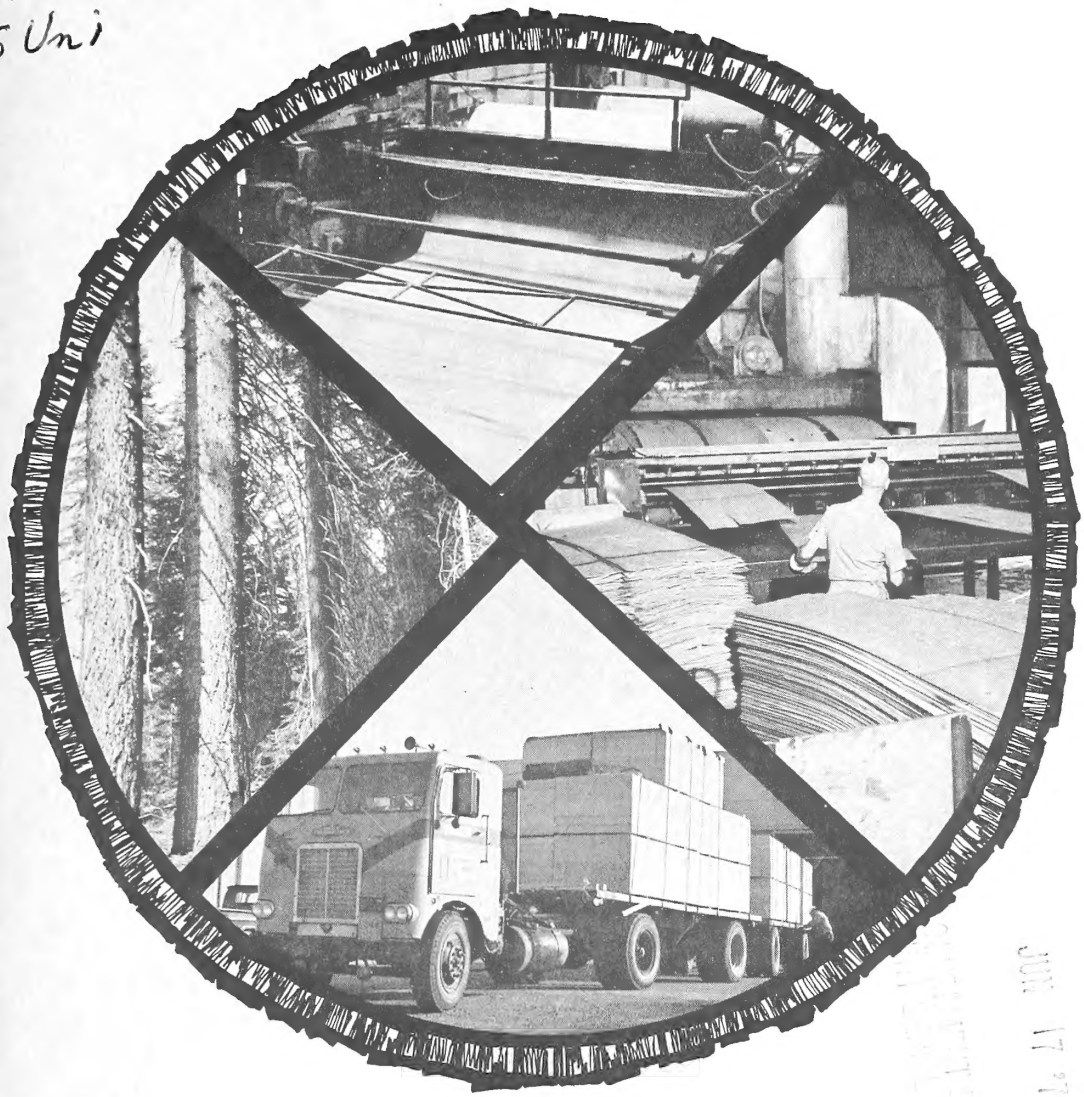
USDA FOREST SERVICE RESEARCH PAPER PNW-171
1974



VENEER RECOVERY OF RED AND WHITE FIR -- CALIFORNIA

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ABSTRACT

Red and white fir grade recovery percentages are presented by log and veneer block diameter classes. Less than 1 percent of veneer was recovered in A and B grades. About 55 percent of both the log volumes or block volumes was recovered as dry, untrimmed veneer. Relationships of recovery ratio and square feet or cubic feet of veneer to log volume are shown.

Keywords: Veneer mill studies, red fir, *Abies magnifica*, white fir, *Abies concolor*.

CONTENTS

ACKNOWLEDGMENTS

The information presented in this paper was obtained through the cooperation and assistance of the American Forest Products Co., Inc.; Region 5, U.S. Forest Service; Bureau of Land Management, Department of the Interior; and the American Plywood Association.

INTRODUCTION

The true firs (*Abies* spp.) represent approximately 13 percent of the commercial sawtimber volume in the Western United States. This amounts to nearly 235 billion board feet. In California the true firs comprise about 25 percent of the softwood sawtimber volume. In the central Sierra of California, nearly 50 percent of the sawtimber volume is composed of California red fir (*A. magnifica* A. Murr.) and white fir (*A. concolor* (Gord. and Glend.) Lindl.).

Both these species have increased in importance as raw material for the wood using industry. However, only a small number of mills use true fir in plywood. In 1970, over 620 million board feet, log scale, of red and white fir were produced from National Forest lands in California; in contrast, these same Forest lands produced about 380 million feet in 1960.

With expanded utilization of the true firs, a need has developed for up-to-date information on grade and volume recovery of lumber and veneer from these species. To provide this information, the Pacific Northwest Forest and Range Experiment Station conducted this study in cooperation with other public agencies and the forest products industry.

Veneer yield information is presented according to current Forest Service Region 5 log grading and scaling practices for short logs.

Forest managers, timber buyers, and forest industry plant managers will find this report useful in estimating veneer grade and volume recovery.

The volume losses in red and white fir plywood production can be estimated from other reports (*8*, *10*).

STUDY PROCEDURE

Sampling

The timber sample was divided into two segments, one for processing in a veneer plant and one for processing at a sawmill. This report presents the peeling or veneer recovery phase. The lumber recovery phase will be discussed in a separate report.

Trees for the study were selected from 18 areas located on the Tahoe, Eldorado, and Stanislaus National Forests in the central Sierra Nevada of California. Area locations are shown in figure 1. The sample of 123 trees, including both California red fir and white fir, represented the full range of size and quality of true fir timber in the central Sierra Nevada. Individual trees were stratified on the basis of size, butt log grade,[1/] and defect classes (*5*).

[1/] Based on Forest Service Region 6 west-side Douglas-fir log grades without diameter limits.

Figure 1.--*Approximate locations of timber sample areas (•) and study mill (✱).*

Each tree was examined before it was felled, and surface characteristics for the first 32 feet were diagramed (*1*, *3*). The felled trees were bucked into logs of multiple 8-foot block lengths. Small unpeelable logs from the upper part of the tree and segments less than 8 feet long were not considered study material and were not processed. Maximum bucked length was 34 feet.

Log Diagraming, Scaling, and Grading

Before the bucked logs were skidded, visible log surface characteristics were diagramed, tree and log diameters and lengths were recorded, and logs were tagged for identification. Logs delivered to the mill were decked and kept under water spray until removed for debarking and bucking into blocks the day before they were peeled. These blocks were scaled (*6*) and retagged for identification. Individual blocks and short logs (composite of two blocks) were graded by applying the Forest Service grades for white fir to the log surface diagrams (*7*).

Peeling, Drying, and Grading

According to mill practice, all study blocks were steamed for approximately 18 hours at 180° F. The 977 blocks in the study ranged from 7 to 48 inches in small-end diameter. Block lengths and diameters were measured before they were peeled.

All blocks were peeled on a single 8-foot lathe with blocks positioned and chucked in the geometric center. Minimum core size possible was about 6 inches. The diameter of the peeler core, its condition (rotten, checked, or shattered due to spin-out), and its disposition (chipped, sawn into lumber, or burned) were recorded.

Veneer was peeled into 1/10-, 1/8-, and 3/16-inch thicknesses. A single block was peeled into only one thickness. Throughout the peeling phase of the study, a quality supervisor from the American Plywood Association made periodic checks on the quality and thickness of the peel.

Study blocks were peeled in groups of 20; block identity of individual pieces of veneer was maintained by color coding all veneer from a given block with a continuous stripe of water-soluble dye sprayed on the tight side of the veneer as it was peeled from the block (*2*). Green veneer from each of the 20-block groups was clipped, sorted, and stored separately from other 20-block groups of veneer. Loads of green veneer from a given group were color coded for group identity before storage.

Green veneer items produced in this study included full sheets, half sheets, and random width strips in 4- and 8-foot lengths. The veneer was sorted onto carts by automatic pullers, except for 4-foot strips (fishtails) which were hand-pulled. Sapwood and heartwood veneer pieces were not separated at the green chain.

All veneer was dried by green item and thickness. The color code identity of veneer from each block in the group of 20, for a given item and thickness, was maintained during drying, grading, and tallying.

Dry veneer was graded by and under the supervision of the American Plywood Association quality supervisors. Grading was by U.S. commercial standards (*4*): A, A patch, B, B patch, C, C plug, D.

Each piece of veneer was tallied separately by grade, block, color code, and 20-block group number. Full sheets were dried separately and graded and tallied as they were pulled onto the dry sorting table. Half sheets and random width strips of veneer were dried together and graded as they came from the dryer. Half sheets were tallied as they were pulled onto the dry sorting table, but random width veneer was pulled onto carts then tallied by piece.

Dry veneer with isolated large defects which could be upgraded by reclipping was marked "reclip" and was pencil clipped and tallied as random width. Minimum reclipping width was 8 inches. Below grade veneer utilized by the mill was tallied but reported separately from graded veneer. Veneer needing redrying was pulled, graded, and tallied without going through the dryer again.

Compilation of data

Veneer recovery was summarized by grade, size, and peeler block number by use of computer programs (*9*) developed to handle veneer recovery data. Outputs from these programs include veneer grade yield in square-foot and cubic-foot volumes, recovery by block and log diameter classes, distribution of veneer by grade and piece size. The tally of dry, untrimmed veneer obtained from the peeled blocks was compiled into veneer grade yields on a square-foot, 3/8-inch basis.

The veneer grade yield for the short logs was obtained by combining the block veneer recovery of successive pairs of blocks from each sample tree. The cubic volumes of the blocks, veneer, core, below grade veneer, and residue were calculated.

The gross cubic block volume was computed by the following formula:

$$\text{Gross cubic-foot volume} = 0.001818L(D_S^2 + D_S D_L + D_L^2)$$

Where

0.001818 is a constant;

L is the actual block length in feet;

D_S is the average block diameter, small end, in inches; and

D_L is the average block diameter, large end, in inches.

Individual peeler blocks were summed to provide the cubic volume of short logs.

Residue veneer volume was obtained by subtracting the total veneer, core, and below grade veneer volumes from the gross block volume. The residue total, therefore, includes spur and roundup, green clipper, and dryer losses.

RESULTS

The graphs in figures 2 and 3 indicate the relative distribution of the short logs and peeler blocks by log grade. The 479 short logs produced 416,908 square feet of veneer, 3/8-inch basis. A summary of the total scale and cubic volumes of these logs for each log grade is presented in table 1. Detailed log volumes and distributions by log grade and diameter class are presented in Appendix A, tables 5 to 19. Blocks and logs were graded by the same log grade specifications.

The 977 veneer blocks produced 416,652 square feet of veneer. A summary of log scale and cubic volume is presented in table 2. Detailed volumes by log grade and diameter class are presented in appendix B, tables 20 to 34.

There is a difference between the total veneer volume shown for the short logs and that for blocks because any cull (less than one-third sound) veneer block that was bucked from a noncull short log but produced veneer was included with the adjacent block. However, these cull blocks, along with the small amount of veneer they produced, are not included in the tables of individual block data.

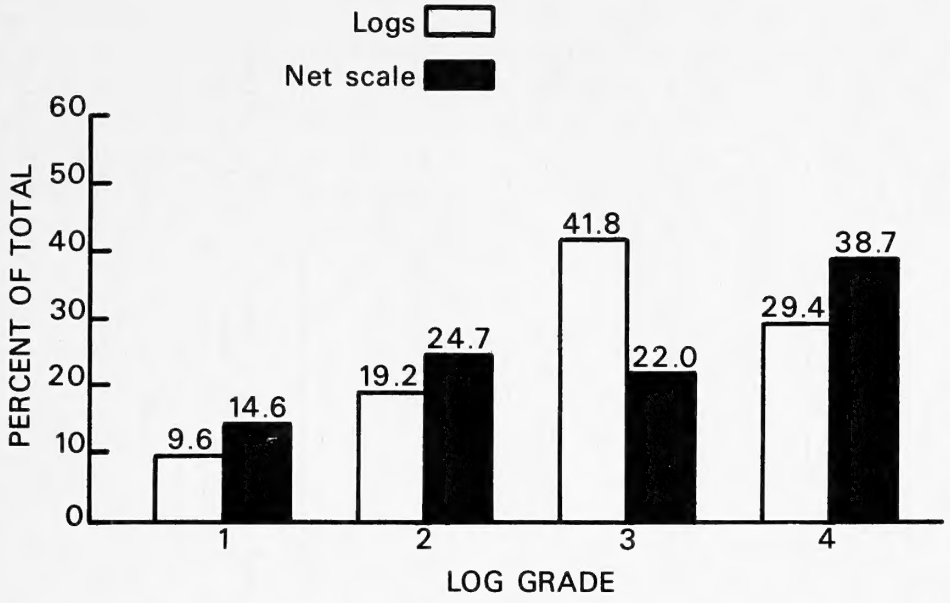

Figure 2.--*Distribution of 479 red and white fir logs by percentage of total number of logs and net scale for each log grade.*

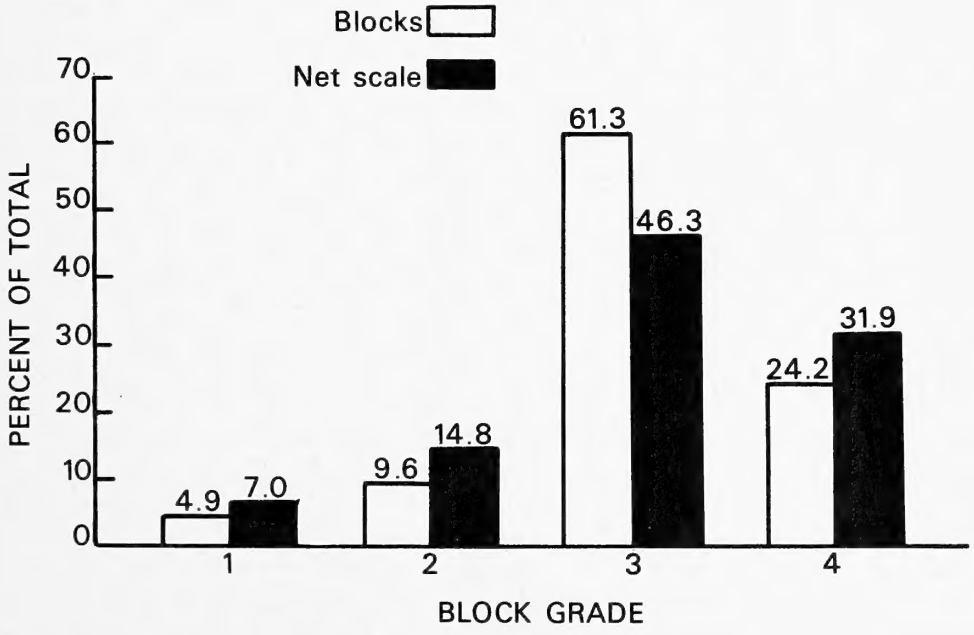

Figure 3.--*Distribution of 977 red and white fir veneer blocks by percentage of total number and net scale for each block grade.*

Table 1.—Total scale, veneer tally, and cubic volumes of red and white fir logs by log grade

Log grade	Number of logs	Scale		Veneer tally		Volume					
		Gross	Net	Volume, 3/8-inch basis	Recovery ratio	Block	Veneer	Veneer recovery	Below grade veneer	Core	Residue
		Board feet		*Square feet*		*Cubic feet*		*Percent*	*Cubic feet*		
1	46	26,190	23,530	65,273	2.77	3,593.45	2,145.65	59.71	41.21	284.03	1,122.56
2	92	46,260	40,020	107,392	2.68	6,411.96	3,535.60	55.14	100.64	591.48	2,184.24
3	200	37,340	35,630	96,621	2.71	5,823.48	3,169.27	54.42	90.19	976.76	1,587.26
4	141	67,360	62,470	147,622	2.36	9,219.14	4,867.35	52.80	217.43	982.32	3,152.04
All grades	479	177,150	161,650	416,908	2.58	25,048.03	13,717.87	54.77	449.47	2,834.59	8,046.10

Table 2.—Total scale, veneer tally, and cubic volumes of red and white fir blocks by block grade

Block grade	Number of blocks	Scale		Veneer tally		Volume					
		Gross	Net	Volume, 3/8-inch basis	Recovery ratio	Block	Veneer	Veneer recovery	Below grade veneer	Core	Residue
		Board feet		*Square feet*		*Cubic feet*		*Percent*	*Cubic feet*		
1	48	13,300	11,370	32,310	2.84	1,929.19	1,062.07	55.05	29.15	160.03	677.94
2	94	26,960	24,010	63,655	2.65	3,832.45	2,096.03	54.69	57.17	312.82	1,366.43
3	599	80,220	75,340	199,829	2.65	11,554.90	6,568.01	56.84	179.92	1,509.19	3,297.78
4	236	55,600	51,960	120,858	2.33	7,655.68	3,983.29	52.03	180.01	835.29	2,657.09
All grades	977	176,080	162,680	416,652	2.56	24,972.22	13,709.40	54.90	446.25	2,817.33	7,999.24

Scaling Defects

All logs in this report are at least one-third sound as determined by the scaler. Figure 4 presents the relationship of defect percentage (Scribner scale) to log and block diameter for all grades combined. Average scaling defect percentage was 8.7 for short logs and 7.6 for peeler blocks.

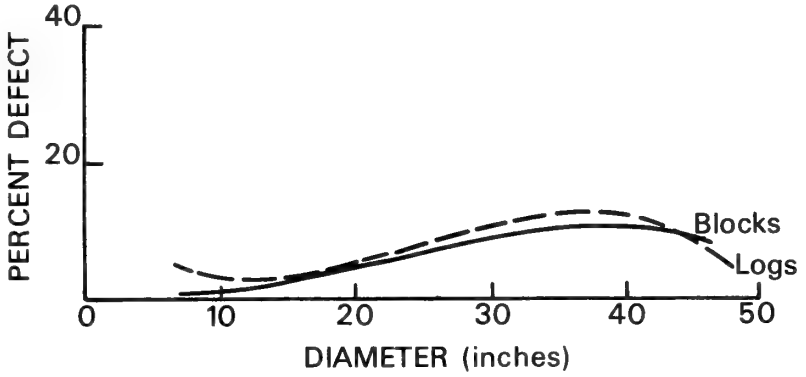

Figure 4.--*Relationship of percent defect to diameter for woods-length red and white fir logs and veneer blocks.*

Veneer Recovery Ratio

The range in veneer recovery volume and recovery ratio can be compared by log grade and diameter class from appendix A, tables 5 to 9, and appendix B, tables 20 to 24. Veneer recovery ratio is square feet of dry, untrimmed veneer (3/8-inch basis) per board foot of net log or net block scale. Figure 5 shows the relationship of the recovery ratios to scaling diameter for all log grades combined. Although average recovery ratios shown in the tables differ between log grades, they are somewhat similar for logs of the same diameter classes.

Cubic Recovery Percentage

The veneer recovery percentages are similar among the four log and block grades (tables 1 and 2). With short logs, the cubic recovery decreased from 59.71 percent for grade 1, to 52.8 percent for grade 4, table 1. The relationship of cubic recovery ratio to block and log scaling diameter is shown in figure 6. Figure 7 shows for this sample the number of square feet of veneer (3/8-inch basis) that was produced per cubic foot of log or block volume. A mill manager having a cubic estimate of log or block input to the veneer mill could use figure 7 to estimate the total square-foot recovery volume that could be expected from the logs or blocks.

LOGS:

$Y = -0.523174 + 0.349716(D) - 0.011836(D^2) + 0.000124(D^3)$

BLOCKS:

$Y = 0.206857 + 0.234081(D) - 0.007238(D^2) + 0.000072(D^3)$

Y is recovery ratio, D is block or log diameter.

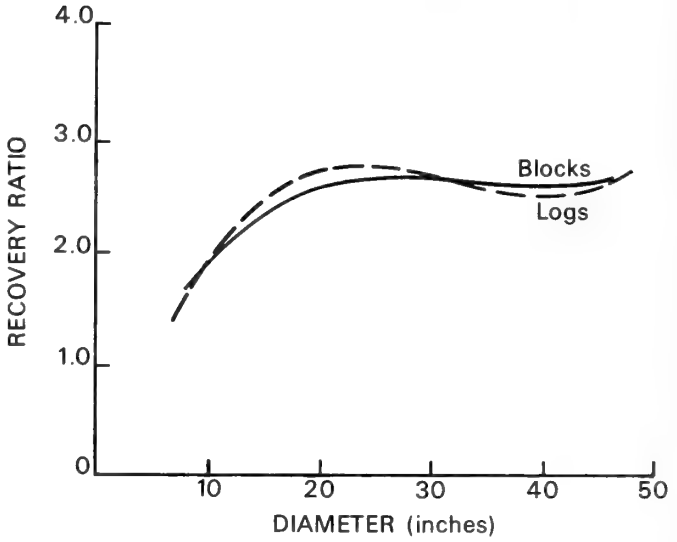

Figure 5.--*Relationship of veneer recovery ratio to log and block diameters of red and white fir. Recovery ratio is square feet of dry, untrimmed veneer, 3/8-inch basis, per board foot of net scale.*

LOGS:

$Y = -0.417865 + 0.100024(D) - 0.003217(D^2) + 0.000033(D^3)$

BLOCKS:

$Y = -0.482209 + 0.107703(D) - 0.003599(D^2) + 0.000039(D^3)$

Y is cubic ratio, D is block or log diameter.

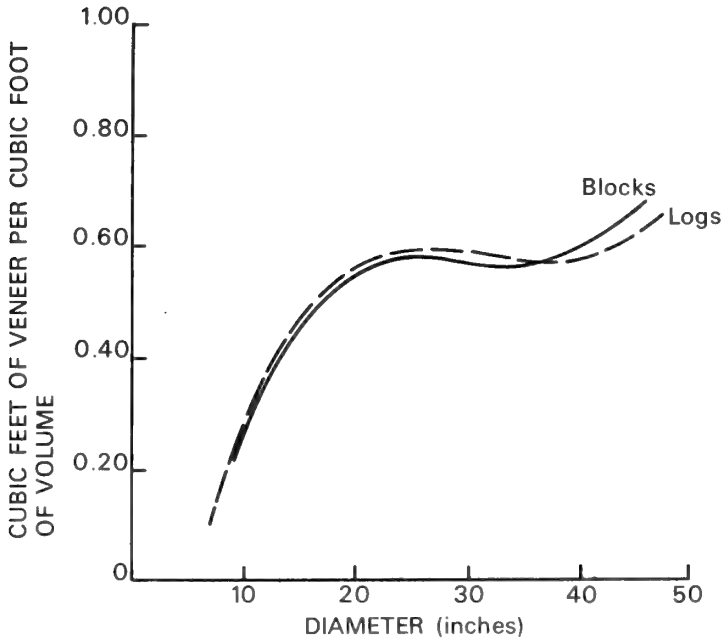

Figure 6.--*The relationship of cubic feet of veneer volume per cubic foot of log and block volume for red and white fir by diameter.*

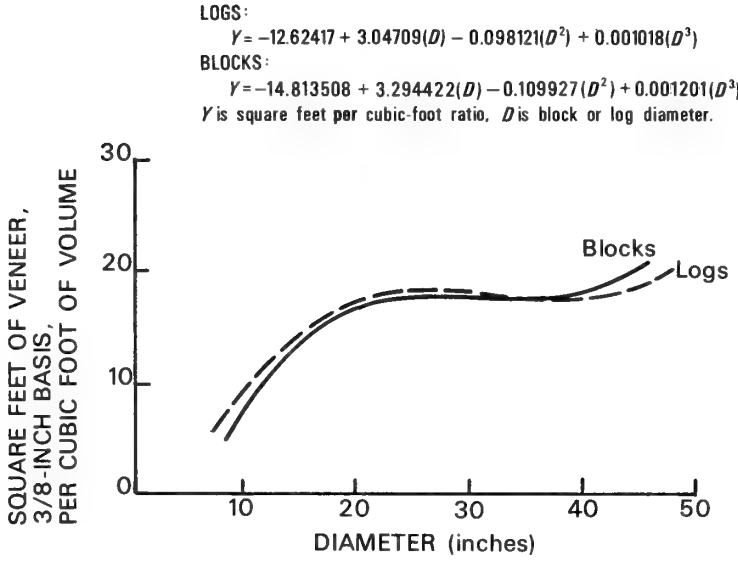

Figure 7.--*The relationship of square feet of veneer (3/8-inch basis) per cubic foot of log or block volume for red and white fir by diameter.*

The following example uses both the recovery ratio data in figure 5 and square feet per cubic foot curves in figure 7.

A mix of log lengths and diameters could be used. However, assume for these examples an average scaling diameter of 18 inches and a 17-foot scaling length for 250 logs.

Example using square feet to cubic-foot ratio:

Gross scale = 57,500 board feet, Scribner
Net scale = 52,325 board feet, Scribner
Average cubic feet per log = 34.5 (calculated from number of logs and cubic log volume for 18-inch logs, appendix A, table 9)
Total cubic feet in example = 8,625.

The yield from 18-inch logs was 16.4 square feet of veneer, 3/8-inch basis, per cubic foot of log (read from short log curve, 18-inch diameter, fig. 7).

250 logs = 141,450 square feet, 3/8-inch basis.

Example using recovery ratio:

Recovery ratio for 18-inch logs = 2.65 (read from short log curve for fig. 5).

Recovery ratio of square feet of 3/8-inch veneer per board foot net scale = 2.65 x 52,325 = 138,661 square feet, 3/8-inch basis.

Calculations by the two methods result in a difference of about 2 percent or 2,789 square feet of veneer, 3/8-inch basis.

The calculations in each example could be made using the overall study ratios of 16.64 square feet per cubic foot and 2.58 square feet per board foot net scale.

Veneer Grade Recovery

The veneer recovery volume for each veneer grade produced from logs of various diameter classes is requested often by forest product industry representatives. This report provides this information for red and white fir. Tables 3 and 4 show the average veneer recovery percentages by each log grade for logs and blocks. A more detailed description of veneer grade recovery by log grade and diameter classes for short logs is shown in appendix A, tables 10 to 14, and for veneer blocks, in appendix B, tables 25 to 29.

The actual or uncurved distributions of veneer grade percentages by diameter classes in appendix A and appendix B are presented as regressions in figures 8 and 9. A detailed discussion of all appendix tables is not justified. However, the regression curves point up obvious grade recovery information. For short logs, the volume of B patch and better veneer recovered was only slightly over 1 percent, regardless of the grade. The percentage of C veneer was nearly as high for grade 3 as for grade 2 (56.4 and 59.2 percent, respectively). Of all veneer from grade 4 logs, 83 percent was grade D; 21 percent of the veneer from grade 1 logs was grade D; for all short logs in the study, 51.3 percent of the veneer product was grade D.

The individual veneer blocks present a similar pattern of veneer grade recovery. The percentage of C veneer decreases in rather uniform increments from grade 1 to 3 (table 4). However, it then drops sharply from 46.1 to 10.5 percent for grade 4. Both short logs and blocks had a similar C plug veneer grade recovery. Short log grades 1 and 2 recovered 18.1 and 16.0 percent of C plug, and grades 3 and 4 recovered 5.5 and 5.1 percent. Individual veneer blocks recovered 20.9 and 20.2 percent of C plug for grades 1 and 2 but recovered only 8.3 percent for grade 3 and 4.7 percent for grade 4. These percentages are summarized in tables 3 and 4.

Veneer Item Recovery

Distribution of the veneer volume by grade and item is shown for short logs in appendix A, tables 15 to 19, and for blocks in appendix B, tables 30 to 34. Veneer thickness is shown for each item size--full sheets, half sheets, and random width veneer. Approximately 33 percent of the volume from woods-length logs was peeled as 1/10-inch veneer, 49 percent as 1/8-inch veneer, and 18 percent as 3/16-inch veneer.

Table 3.—Average veneer grade recovery of short logs of red and white fir by log grade

Log grade	Number of logs	Veneer volume, 3/8-inch basis	Veneer grade						
			A	A patch	B	B patch	C	C plug	D
		Square feet	*Percent*						
1	46	65,273	0	0	0.3	1.0	59.2	18.1	21.4
2	92	107,392	0	0	(1/)	(1/)	46.4	16.0	37.6
3	200	96,621	(1/)	0	(1/)	0	56.4	5.5	38.1
4	141	147,622	0	0	.1	0	11.8	5.1	83.0
All grades	479	416,908	(1/)	0	.1	.2	38.4	10.0	51.3

1/ Less than 0.05 percent.

Table 4.—Average veneer grade recovery of red and white fir by block grade

Block grade	Number of blocks	Veneer volume, 3/8-inch basis	Veneer grade						
			A	A patch	B	B patch	C	C plug	D
		Square feet	*Percent*						
1	48	32,310	0	0	0.5	1.0	65.1	20.9	12.5
2	94	63,655	0	0	.2	.6	53.9	20.2	25.1
3	599	199,829	(1/)	0	(1/)	0	46.1	8.3	45.6
4	236	120,858	0	0	(1/)	0	10.5	4.7	84.8
All grades	977	416,652	(1/)	0	.1	.2	38.4	10.0	51.3

1/ Less than 0.05 percent.

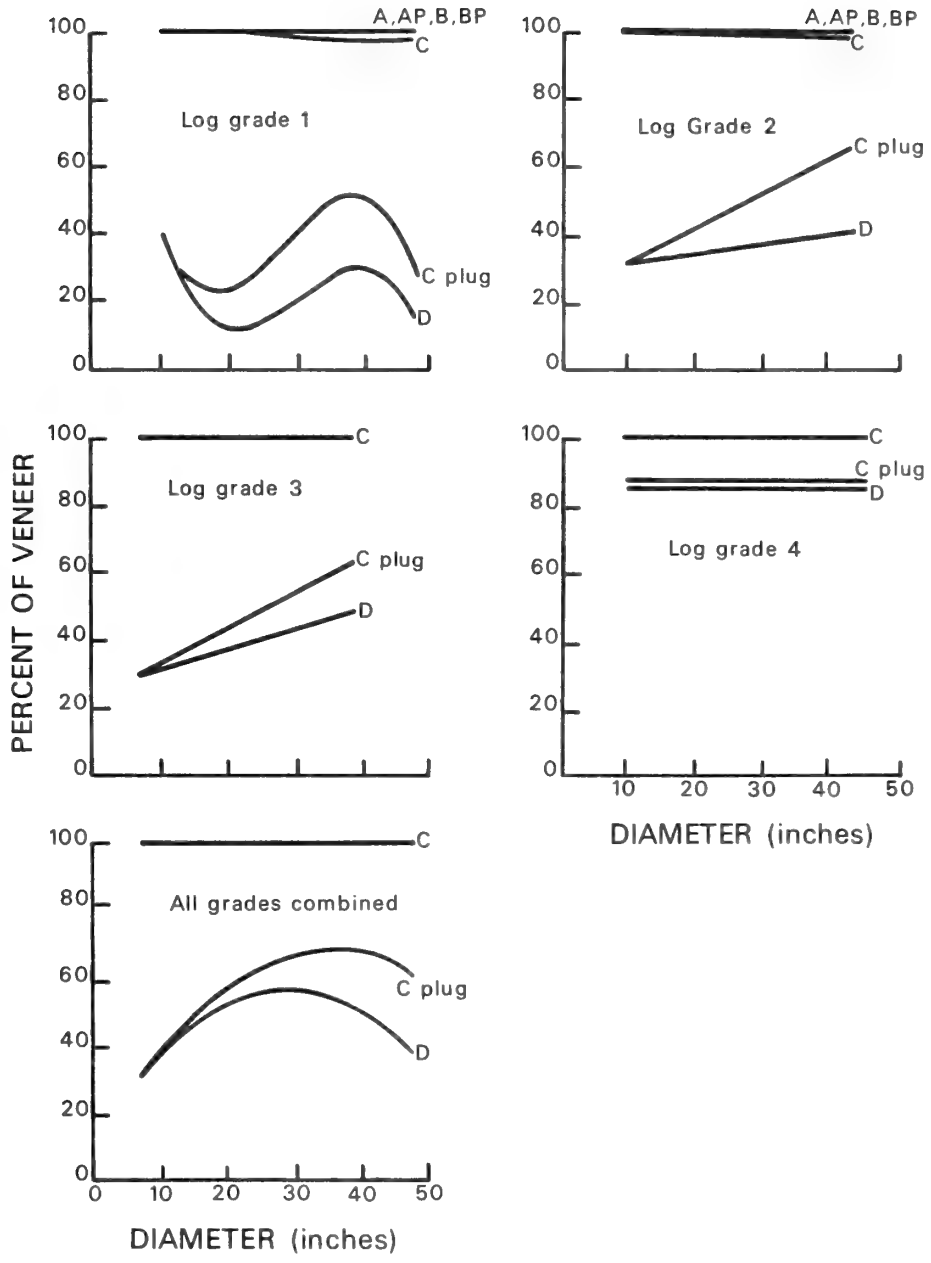

Figure 8.--*Recovery of veneer grades by log scaling diameter for each log grade and all logs combined; AP is A patch, BP is B patch. For grades 3 and 4 and all grades combined, A, AP, B, and BP are less than 1 percent of total.*

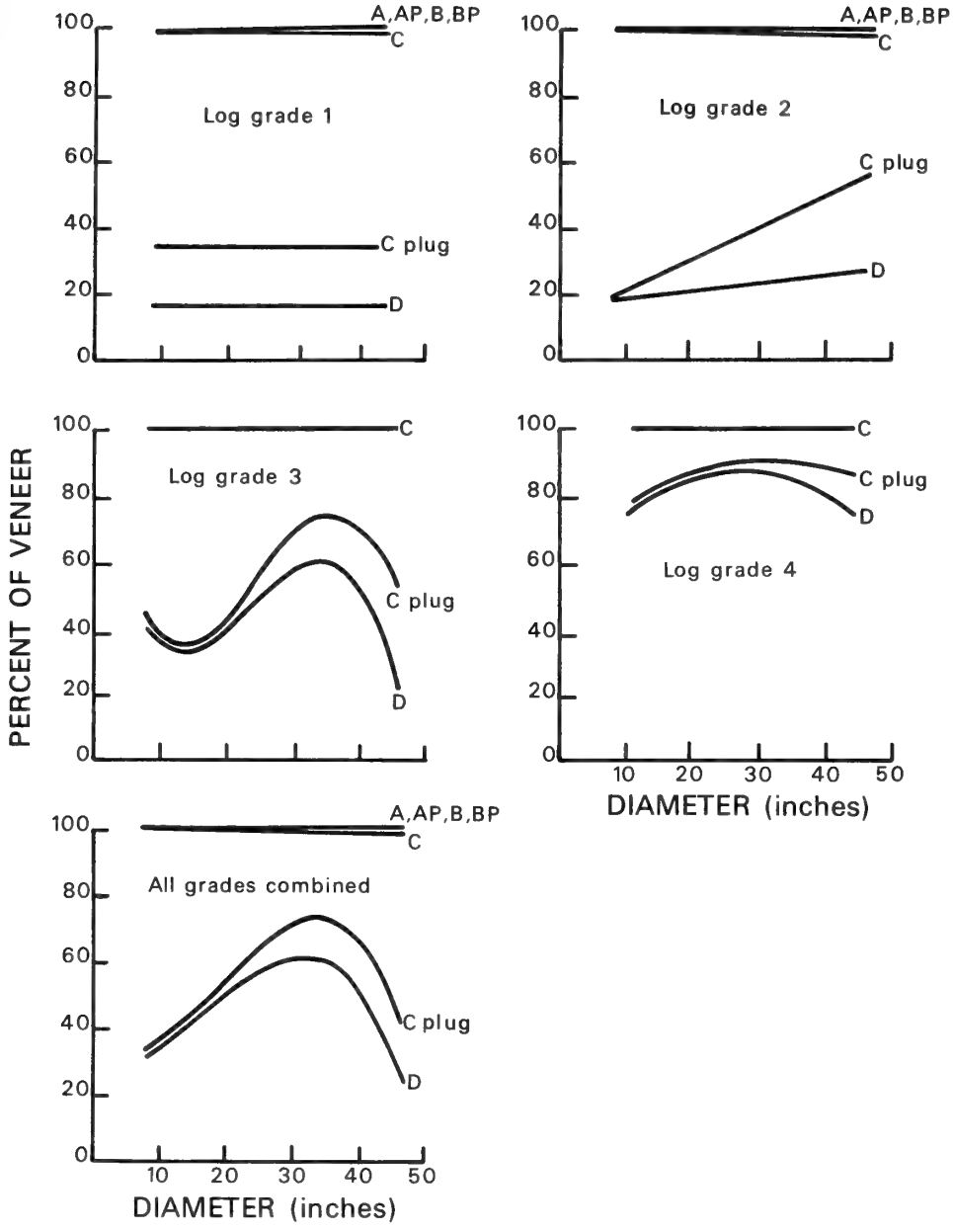

Figure 9.--*Recovery of veneer grades by block scaling diameter for each block grade and all blocks combined; AP is A patch, BP is B patch. For grades 3 and 4, A, A patch, B, and B patch have insufficient data for plotting.*

A separate column is included in these tables for below grade veneer. This represents veneer clipped and dried for use in mill-certified plywood panels. Grade D specifications admit some rot in the veneer sheet. Some of the below grade veneer was produced from veneer with amounts of rot that exceeded the grade D specification.

The green veneer full sheets were peeled and clipped to approximately 52½ by 101 inches. The resulting dry veneer sheet averaged slightly over 51 by 101 inches.

Veneer production from individual blocks was almost equally divided among the three veneer items: full sheets, 34.1 percent of the volume; half sheets, 34.2 percent; and random width strips, 31.7 percent.

CONCLUSIONS

The veneer grade recovery from the mix of red and white fir logs in this study was less than 1 percent A and B grade veneer. There was no significant difference in veneer grade recovery between No. 1 and No. 2 grade logs. However, grade C veneer recovery ranged from 59 percent for No. 1 logs to 12 percent for No. 4 logs.

Approximately 55 percent of the cubic volume of the short log or block was recovered as dry, untrimmed veneer.

The overall average veneer recovery ratio was 2.58 based on total net scale and total dry, untrimmed veneer. This would be reduced by about 16 percent by losses in plywood production from the dryer through panel trimming.

A veneer mill can use this information to estimate total square-foot, 3/8-inch basis, production from known scale or cubic volume of logs or blocks. Veneer grade production can be estimated from curves of grade recovery.

The overlapping and similarity of veneer grade recovery between log grades indicates the need for a revised red and white fir log grade or quality estimating system.

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APPENDIX A

LOGS

Table 5.—Log scale, veneer tally, and cubic volumes by scaling diameter, grade 1 red and white fir logs

Log scaling diameter (inches)	Number of logs	Scale		Veneer tally		Volume					
		Gross	Net	Volume, 3/8-inch basis	Recovery ratio	Log	Veneer	Veneer recovery	Below grade veneer	Core	Residue
		- Board feet -		Square feet		- - - Cubic feet - - -		Percent	- - - - Cubic feet - - - -		
11	1	70	70	110	1.57	13.52	3.65	27.00	0.09	3.96	5.82
12	0	--	--	--	--	--	--	--	--	--	--
13	6	600	570	1,288	2.26	121.17	42.48	35.06	3.32	30.73	44.64
14	2	240	210	562	2.68	42.55	18.68	43.90	.63	8.10	15.14
15	1	150	150	449	2.99	22.42	14.87	66.32	0	3.96	3.59
16	0	--	--	--	--	--	--	--	--	--	--
17	2	400	360	953	2.65	63.99	31.58	49.35	1.06	15.26	16.09
18	3	690	660	1,821	2.76	104.25	59.72	57.28	2.41	13.22	28.90
19	1	250	220	729	3.31	43.20	24.13	55.86	.15	3.84	15.08
20	2	600	600	1,463	2.44	87.90	47.45	53.98	.87	8.37	31.21
21	1	320	310	952	3.07	46.69	31.38	67.21	.13	3.90	11.28
22	0	--	--	--	--	--	--	--	--	--	--
23	3	1,200	1,120	3,079	2.75	171.81	100.88	58.72	.82	12.20	57.91
24	0	--	--	--	--	--	--	--	--	--	--
25	5	2,450	2,170	5,244	2.42	339.49	172.67	50.86	4.23	44.85	117.74
26	1	530	490	1,515	3.09	78.93	49.96	63.30	.44	3.90	24.63
27	1	580	530	1,559	2.94	70.66	51.61	73.04	.32	3.96	14.77
28	1	620	560	1,749	3.12	94.48	57.92	61.30	1.24	3.90	31.42
29	0	--	--	--	--	--	--	--	--	--	--
30	0	--	--	--	--	--	--	--	--	--	--
31	4	3,000	2,430	5,875	2.42	437.27	193.04	44.15	11.36	29.38	203.49
32	1	780	670	2,211	3.30	97.70	73.15	74.87	.96	3.72	19.87
33	1	830	750	2,092	2.79	105.70	69.27	65.54	.59	7.58	28.26
34	1	850	770	2,192	2.85	108.45	72.31	66.68	2.58	5.71	27.85
35	1	930	830	2,458	2.96	129.55	81.06	62.57	1.52	3.90	43.07
36	2	1,960	1,700	5,401	3.18	267.79	178.17	66.53	1.00	19.71	68.91
37	0	--	--	--	--	--	--	--	--	--	--
38	0	--	--	--	--	--	--	--	--	--	--
39	0	--	--	--	--	--	--	--	--	--	--
40	0	--	--	--	--	--	--	--	--	--	--
41	2	2,700	2,490	7,208	2.89	314.86	236.03	74.96	1.60	20.65	56.58
42	1	1,430	1,290	3,970	3.08	198.68	129.59	65.22	1.93	5.31	61.85
43	1	1,480	1,330	4,086	3.07	187.91	131.77	70.12	.66	4.64	50.84
44	0	--	--	--	--	--	--	--	--	--	--
45	0	--	--	--	--	--	--	--	--	--	--
46	1	1,690	1,520	4,129	2.72	241.27	136.38	56.53	3.14	10.85	90.90
47	1	1,840	1,730	4,178	2.42	203.21	137.90	67.86	.16	12.43	52.72
48	0	--	--	--	--	--	--	--	--	--	--
Total or average	46	26,190	23,530	65,273	2.77	3,593.45	2,145.65	59.71	41.21	284.03	1,122.56

Table 6.—Log scale, veneer tally, and cubic volumes by scaling diameter, grade 2 red and white fir logs

Log scaling diameter (inches)	Number of logs	Scale		Veneer tally		Volume					
		Gross	Net	Volume, 3/8-inch basis	Recovery ratio	Log	Veneer	Veneer recovery	Below grade veneer	Core	Residue
		- Board feet -		Square feet		- - - Cubic feet - - -		Percent	- - - - Cubic feet - - - -		
9	3	120	110	195	1.77	27.17	6.48	23.85	0.51	13.62	6.56
10	3	220	220	513	2.33	44.76	16.99	37.96	.35	13.92	13.50
11	2	140	140	378	2.70	29.28	12.37	42.25	.25	7.80	8.86
12	4	320	310	760	2.45	68.56	25.02	36.49	1.78	16.86	24.90
13	1	100	100	303	3.03	20.76	9.99	48.12	.16	3.84	6.77
14	1	120	120	275	2.29	20.24	9.02	44.56	.21	3.96	7.05
15	6	900	870	2,386	2.74	151.81	78.75	51.87	1.25	25.89	45.92
16	5	850	830	2,175	2.62	142.87	71.25	49.87	1.27	20.11	50.24
17	5	1,100	1,030	2,470	2.40	155.11	81.40	52.48	3.90	19.80	50.01
18	4	910	910	2,655	2.92	142.46	87.26	61.25	.47	16.17	38.56
19	4	1,000	980	2,485	2.54	155.03	81.94	52.85	2.77	16.48	53.84
20	4	1,200	1,110	2,432	2.19	172.32	80.29	46.59	5.18	15.73	71.12
21	1	320	310	878	2.83	52.89	29.12	55.06	.70	3.96	19.11
22	4	1,400	1,370	4,411	3.22	200.72	144.76	72.12	2.05	15.42	38.49
23	2	800	770	2,383	3.09	107.53	77.90	72.44	1.46	8.55	19.62
24	2	860	860	2,376	2.76	122.47	77.68	63.43	1.57	18.37	24.85
25	2	980	800	1,587	1.98	133.62	52.58	39.35	6.52	19.65	54.87
26	3	1,590	1,410	4,122	2.92	206.31	135.25	65.56	2.99	28.82	39.25
27	3	1,740	1,280	3,163	2.47	189.85	104.68	55.14	2.08	22.87	60.22
28	2	1,240	1,120	3,078	2.75	171.76	100.33	58.41	.87	13.31	57.25
29	5	3,200	2,750	7,863	2.86	476.83	257.87	54.08	12.56	40.89	165.51
30	3	2,100	1,820	5,229	2.87	273.01	172.96	63.35	4.69	18.72	76.64
31	3	2,250	1,720	4,403	2.56	305.60	145.79	47.71	6.63	26.99	126.19
32	3	2,340	1,960	5,542	2.83	337.53	183.10	54.25	2.44	19.92	132.07
33	0	--	--	--	--	--	--	--	--	--	--
34	1	850	750	2,585	3.45	115.16	85.30	74.07	.69	7.24	21.93
35	2	1,860	1,670	4,639	2.78	253.68	151.55	59.74	3.03	16.02	83.08
36	1	980	930	2,441	2.62	148.17	78.70	53.12	1.33	9.94	58.20
37	3	3,270	2,860	8,446	2.95	424.72	278.77	65.64	3.18	21.53	121.24
38	3	4,040	2,830	7,971	2.82	527.58	263.06	49.86	2.86	40.86	220.80
39	0	--	--	--	--	--	--	--	--	--	--
40	4	5,120	4,810	11,234	2.34	656.26	370.79	56.50	15.05	37.97	232.45
41	0	--	--	--	--	--	--	--	--	--	--
42	2	2,860	2,560	5,577	2.18	367.81	184.02	50.03	9.79	23.76	150.24
43	1	1,480	710	2,437	3.43	210.09	80.63	38.38	2.05	22.51	104.90
Total or average	92	46,260	40,020	107,392	2.68	6,411.96	3,535.60	55.14	100.64	591.48	2,184.24

Table 7.—Log scale, veneer tally, and cubic volumes by scaling diameter, grade 3 red and white fir logs

Log scaling diameter (inches)	Number of logs	Scale		Veneer tally		Volume					
		Gross	Net	Volume, 3/8-inch basis	Recovery ratio	Log	Veneer	Veneer recovery	Below grade veneer	Core	Residue
		- Board feet -		Square feet		- - - Cubic feet - - -		Percent	- - - - Cubic feet - - - -		
7	1	30	30	1	0.03	7.64	0.05	0.65	0	0	7.59
8	6	250	190	366	1.93	57.82	12.14	21.00	.63	23.05	22.00
9	22	1,220	1,210	2,655	2.19	275.46	87.65	31.82	2.66	97.17	87.98
10	28	2,220	2,150	4,876	2.27	446.12	160.74	36.03	3.17	141.81	140.40
11	14	1,100	1,080	2,882	2.67	222.23	94.98	42.74	3.47	62.24	61.54
12	15	1,480	1,480	4,150	2.80	287.92	136.02	47.24	3.57	71.51	76.82
13	15	1,490	1,460	3,942	2.70	271.87	129.48	47.63	1.97	66.56	73.86
14	9	1,080	1,080	3,184	2.95	195.20	104.85	53.71	2.26	41.63	46.46
15	12	1,800	1,750	4,817	2.75	309.40	157.60	50.94	2.88	65.54	83.38
16	14	2,650	2,640	7,773	2.94	422.21	255.02	60.40	7.26	58.80	101.13
17	6	1,200	1,180	3,361	2.85	188.54	110.89	58.82	5.35	24.13	48.17
18	8	1,830	1,830	4,743	2.59	271.39	156.14	57.53	2.69	42.96	69.60
19	6	1,500	1,480	4,389	2.97	228.81	143.72	62.81	.53	30.21	54.35
20	7	2,100	2,100	5,363	2.55	301.24	176.04	58.44	3.33	27.42	94.45
21	4	1,280	1,230	3,416	2.78	179.45	111.35	62.05	.84	22.24	45.02
22	8	2,620	2,540	7,328	2.89	363.93	239.93	65.93	5.05	35.09	83.86
23	7	3,080	2,920	7,585	2.60	416.98	249.89	59.93	11.74	41.77	113.58
24	1	430	430	1,199	2.79	59.11	39.69	67.15	1.08	3.78	14.56
25	6	2,940	2,490	6,251	2.51	394.28	205.18	52.04	15.92	57.33	115.85
26	2	1,060	870	2,836	3.26	141.41	92.91	65.70	4.31	14.87	29.32
27	3	1,740	1,690	4,545	2.69	214.57	147.42	68.70	3.83	12.96	50.36
28	1	620	510	1,916	3.76	93.54	61.72	65.98	1.59	5.40	24.83
29	3	1,920	1,720	5,517	3.21	255.57	179.41	70.20	1.96	20.25	53.95
30	0	--	--	--	--	--	--	--	--	--	--
31	0	--	--	--	--	--	--	--	--	--	--
32	0	--	--	--	--	--	--	--	--	--	--
33	0	--	--	--	--	--	--	--	--	--	--
34	2	1,700	1,570	3,526	2.25	218.79	116.45	53.22	4.10	10.04	88.20
Total or average	200	37,340	35,630	96,621	2.71	5,823.48	3,169.27	54.42	90.19	976.76	1,587.26

Table 8.—Log scale, veneer tally, and cubic volumes by scaling diameter, grade 4 red and white fir logs

Log scaling diameter (inches)	Number of logs	Scale		Veneer tally		Volume					
		Gross	Net	Volume, 3/8-inch basis	Recovery ratio	Log	Veneer	Veneer recovery	Below grade veneer	Core	Residue
		- Board feet -		Square feet		- - - Cubic feet - - -		Percent	- - - -	Cubic feet	- - - -
9	1	40	40	72	1.80	12.75	2.33	18.28	0	3.90	6.52
10	3	230	210	395	1.88	58.06	13.04	22.46	.63	22.08	22.31
11	2	210	210	136	.65	39.38	4.33	11.00	0	22.93	12.12
12	5	310	300	464	1.55	60.86	15.33	25.19	.18	24.20	21.15
13	7	740	700	923	1.32	126.33	30.39	24.06	4.08	49.32	42.54
14	2	180	150	116	.77	33.55	3.87	11.54	.06	13.14	16.48
15	7	810	720	1,130	1.57	151.09	36.81	24.36	2.68	42.00	69.60
16	5	850	850	2,335	2.75	154.26	77.21	50.05	1.89	28.82	46.34
17	9	1,890	1,820	3,979	2.19	300.55	131.56	43.77	6.21	51.63	111.15
18	5	1,040	860	2,106	2.45	171.36	68.99	40.26	4.02	35.69	62.66
19	8	2,420	2,280	6,441	2.82	382.63	212.29	55.48	6.47	45.76	118.11
20	7	2,330	2,260	5,340	2.36	342.56	175.96	51.37	2.82	45.33	118.45
21	5	1,840	1,660	3,669	2.21	270.21	121.44	44.94	6.90	39.75	102.12
22	6	2,100	1,700	3,852	2.27	317.01	126.63	39.94	6.87	64.58	118.93
23	4	1,530	1,450	3,755	2.59	199.33	124.16	62.29	1.36	13.68	60.13
24	5	2,150	2,090	5,323	2.55	306.55	176.08	57.44	2.44	33.49	94.54
25	7	3,550	3,440	7,914	2.30	464.35	261.28	56.27	6.17	42.87	154.03
26	5	3,000	2,670	6,805	2.55	389.79	225.00	57.72	5.14	34.03	125.62
27	6	4,540	4,200	9,905	2.36	596.07	327.59	54.96	16.38	38.30	213.80
28	3	1,860	1,790	4,130	2.31	233.75	135.12	57.80	1.77	17.78	79.08
29	10	7,380	6,790	17,173	2.53	961.61	567.14	58.98	24.46	65.11	304.90
30	2	1,030	990	2,611	2.64	138.20	86.39	62.51	2.28	5.76	43.77
31	2	1,500	1,380	2,909	2.11	181.74	96.15	52.90	4.33	21.48	59.78
32	4	3,660	3,280	6,789	2.07	482.42	222.60	46.14	11.75	45.27	202.80
33	5	4,150	3,940	10,276	2.61	559.78	339.29	60.61	14.72	32.76	173.01
34	1	850	800	2,021	2.53	118.34	65.20	55.10	8.88	10.85	33.41
35	2	1,860	1,760	4,754	2.70	253.35	156.81	61.90	4.75	20.92	70.87
36	4	3,920	3,550	8,100	2.28	514.53	266.69	51.83	22.32	35.14	190.38
37	3	3,270	3,040	6,502	2.14	384.75	212.98	55.36	30.72	21.56	119.49
38	1	1,130	1,080	1,944	1.80	151.92	64.12	42.21	.96	9.21	77.63
39	1	1,190	1,030	2,922	2.84	150.14	96.47	64.25	5.04	10.51	38.12
40	1	1,280	1,250	3,066	2.45	152.82	101.57	66.46	.85	4.02	46.38
41	0	--	--	--	--	--	--	--	--	--	--
42	1	1,430	1,350	2,979	2.21	185.17	98.48	53.18	2.56	8.99	75.14
43	1	1,480	1,340	3,302	2.46	172.77	109.16	63.18	1.41	9.18	53.02
44	0	--	--	--	--	--	--	--	--	--	--
45	1	1,610	1,490	3,484	2.34	201.16	114.89	57.11	6.33	12.28	67.66
Total or average	141	67,360	62,470	147,622	2.36	9,219.14	4,867.35	52.80	217.43	982.32	3,152.04

Table 9.—Log scale, veneer tally, and cubic volumes by scaling diameter, all grades, red and white fir logs

Log scaling diameter (inches)	Number of logs	Scale		Veneer tally		Volume					
		Gross	Net	Volume, 3/8-inch basis	Recovery ratio	Log	Veneer	Veneer recovery	Below grade veneer	Core	Residue
		- Board feet -		Square feet		- - - Cubic feet - - -		Percent		- - - - Cubic feet - - - -	
7	1	30	30	1	0.03	7.64	0.05	0.65	0	0	7.59
8	6	250	190	366	1.93	57.82	12.14	21.00	.63	23.05	22.00
9	26	1,380	1,360	2,922	2.15	315.38	96.46	30.58	3.17	114.69	101.06
10	34	2,670	2,580	5,784	2.24	548.94	190.77	34.75	4.15	177.81	176.21
11	19	1,520	1,500	3,506	2.34	304.41	115.33	37.89	3.81	96.93	88.34
12	24	2,110	2,090	5,374	2.57	417.34	176.37	42.26	5.53	112.57	122.87
13	29	2,930	2,830	6,456	2.28	540.13	212.34	39.31	9.53	150.45	167.81
14	14	1,620	1,560	4,137	2.65	291.54	136.42	46.79	3.16	66.83	85.13
15	26	3,660	3,490	8,782	2.52	634.72	288.03	45.38	6.81	137.39	202.49
16	24	4,350	4,320	12,283	2.84	719.34	403.48	56.09	10.42	107.73	197.71
17	22	4,590	4,390	10,763	2.45	708.19	355.43	50.19	16.52	110.82	225.42
18	20	4,470	4,260	11,325	2.66	689.46	372.11	53.97	9.59	108.04	199.72
19	19	5,170	4,960	14,044	2.83	809.67	462.08	57.07	9.92	96.29	241.38
20	20	6,230	6,070	14,598	2.40	904.02	479.74	53.07	12.20	96.85	315.23
21	11	3,760	3,510	8,915	2.54	549.24	293.29	53.40	8.57	69.85	177.53
22	18	6,120	5,610	15,591	2.78	881.66	511.32	58.00	13.97	115.09	241.28
23	16	6,610	6,260	16,802	2.68	895.65	552.83	61.72	15.38	76.20	251.24
24	8	3,440	3,380	8,898	2.63	488.13	293.45	60.12	5.09	55.64	133.95
25	20	9,920	8,900	20,996	2.36	1,331.74	691.71	51.94	32.84	164.70	442.49
26	11	6,180	5,440	15,278	2.81	816.44	503.12	61.62	12.88	81.62	218.82
27	13	8,600	7,700	19,172	2.49	1,071.15	631.30	58.94	22.61	78.09	339.15
28	7	4,340	3,980	10,873	2.73	593.53	355.09	59.83	5.47	40.39	192.58
29	18	12,500	11,260	30,553	2.71	1,694.01	1,004.42	59.29	38.98	126.25	524.36
30	5	3,130	2,810	7,840	2.79	411.21	259.35	63.07	6.97	24.48	120.41
31	9	6,750	5,530	13,187	2.38	924.61	434.98	47.04	22.32	77.85	389.46
32	8	6,780	5,910	14,542	2.46	917.65	478.85	52.18	15.15	68.91	354.74
33	6	4,980	4,690	12,368	2.64	665.48	408.56	61.39	15.31	40.34	201.27
34	5	4,250	3,890	10,324	2.65	560.74	339.26	60.50	16.25	33.84	171.39
35	5	4,650	4,260	11,851	2.78	636.58	389.42	61.17	9.30	40.84	197.02
36	7	6,860	6,180	15,942	2.58	930.49	523.56	56.27	24.65	64.79	317.49
37	6	6,540	5,900	14,948	2.53	809.47	491.75	60.75	33.90	43.09	240.73
38	4	5,170	3,910	9,915	2.54	679.50	327.18	48.15	3.82	50.07	298.43
39	1	1,190	1,030	2,922	2.84	150.14	96.47	64.25	5.04	10.51	38.12
40	5	6,400	6,060	14,300	2.36	809.08	472.36	58.38	15.90	41.99	278.83
41	2	2,700	2,490	7,208	2.89	314.86	236.03	74.96	1.60	20.65	56.58
42	4	5,720	5,200	12,526	2.41	751.66	412.09	54.82	14.28	38.06	287.23
43	3	4,440	3,380	9,825	2.91	570.77	321.56	56.34	4.12	36.33	208.76
44	0	--	--	--	--	--	--	--	--	--	--
45	1	1,610	1,490	3,484	2.34	201.16	114.89	57.11	6.33	12.28	67.66
46	1	1,690	1,520	4,129	2.72	241.27	136.38	56.53	3.14	10.85	90.90
47	0	--	--	--	--	--	--	--	--	--	--
48	1	1,840	1,730	4,178	2.42	203.21	137.90	67.86	.16	12.43	52.72
Total or average	479	177,150	161,650	416,908	2.59	25,048.03	13,717.87	54.77	449.47	2,834.59	8,046.10

Table 10.—Veneer grade recovery by scaling diameter, log grade 1, red and white fir

Log scaling diameter (inches)	Number of logs	Veneer volume, 3/8-inch basis	Veneer grade						
			A	A patch	B	B patch	C	C plug	D
		Square feet	*Percent*						
11	1	110	0	0	0	0	50.9	0	49.1
12	0	--	--	--	--	--	--	--	--
13	6	1,288	0	0	0	0	70.4	4.4	25.2
14	2	562	0	0	0	0	82.2	0	17.8
15	1	449	0	0	0	0	78.8	2.7	18.5
16	0	--	--	--	--	--	--	--	--
17	2	953	0	0	.2	0	82.3	8.7	8.8
18	3	1,821	0	0	0	0	76.6	7.9	15.5
19	1	729	0	0	0	0	96.3	1.4	2.3
20	2	1,463	0	0	0	0	84.7	7.6	7.7
21	1	952	0	0	0	0	51.2	47.1	1.7
22	0	--	--	--	--	--	--	--	--
23	3	3,079	0	0	0	0	79.2	7.7	13.1
24	0	--	--	--	--	--	--	--	--
25	5	5,244	0	0	0	.7	72.1	8.4	18.8
26	1	1,515	0	0	0	0	56.2	15.7	28.1
27	1	1,559	0	0	.7	0	57.0	39.4	2.9
28	1	1,749	0	0	0	0	54.4	43.4	2.2
29	0	--	--	--	--	--	--	--	--
30	0	--	--	--	--	--	--	--	--
31	4	5,875	0	0	.1	0	62.0	5.0	32.9
32	1	2,211	0	0	3.0	0	19.4	50.4	27.2
33	1	2,092	0	0	4.1	0	58.9	31.2	5.8
34	1	2,192	0	0	0	0	12.4	15.2	72.4
35	1	2,458	0	0	0	1.5	44.6	27.4	26.5
36	2	5,401	0	0	0	3.3	37.4	38.9	20.4
37	0	--	--	--	--	--	--	--	--
38	0	--	--	--	--	--	--	--	--
39	0	--	--	--	--	--	--	--	--
40	0	--	--	--	--	--	--	--	--
41	2	7,208	0	0	.2	4.1	63.3	12.0	20.4
42	1	3,970	0	0	0	0	68.4	13.6	18.0
43	1	4,086	0	0	0	0	97.2	0	2.8
44	0	--	--	--	--	--	--	--	--
45	0	--	--	--	--	--	--	--	--
46	1	4,129	0	0	0	0	25.6	28.4	46.0
47	0	--	--	--	--	--	--	--	--
48	1	4,178	0	0	0	3.1	55.6	21.6	19.7
Total or average	46	65,273	0	0	.3	1.0	59.2	18.1	21.4

Table 11.—Veneer grade recovery by scaling diameter, log grade 2, red and white fir

Log scaling diameter (inches)	Number of logs	Veneer volume, 3/8-inch basis	Veneer grade						
			A	A patch	B	B patch	C	C plug	D
		Square feet	*Percent*						
9	3	195	0	0	0	0	40.5	0	59.5
10	3	513	0	0	0	0	49.5	11.7	38.8
11	2	378	0	0	0	0	83.6	0	16.4
12	4	760	0	0	0	0	70.1	0	29.9
13	1	303	0	0	0	0	73.6	0	26.4
14	1	275	0	0	0	0	83.3	0	16.7
15	6	2,386	0	0	0	0	83.1	0	16.9
16	5	2,175	0	0	0	0	63.0	1.4	35.6
17	5	2,470	0	0	0	0	78.7	0	21.3
18	4	2,655	0	0	0	0	73.5	1.4	25.1
19	4	2,485	0	0	0	0	29.1	18.8	52.1
20	4	2,432	0	0	0	0	47.1	7.9	45.0
21	1	878	0	0	0	0	55.0	.8	44.2
22	4	4,411	0	0	0	0	56.9	8.8	34.3
23	2	2,383	0	0	1.3	0	69.6	17.7	11.4
24	2	2,376	0	0	0	0	77.5	8.0	14.5
25	2	1,587	0	0	0	0	36.1	40.8	23.1
26	3	4,122	0	0	0	0	10.6	17.2	72.2
27	3	3,163	0	0	.3	0	58.4	17.7	23.6
28	2	3,078	0	0	0	0	41.2	2.4	56.4
29	5	7,863	0	0	(1/)	0	65.0	3.6	31.4
30	3	5,229	0	0	0	0	27.5	32.2	40.3
31	3	4,403	0	0	0	0	36.9	12.1	51.0
32	3	5,542	0	0	0	.9	50.6	24.4	24.1
33	0	--	--	--	--	--	--	--	--
34	1	2,585	0	0	0	0	5.9	17.1	77.0
35	2	4,639	0	0	0	0	37.8	18.5	43.7
36	1	2,441	0	0	0	0	95.7	0	4.3
37	3	8,446	0	0	(1/)	0	38.5	30.1	31.4
38	3	7,971	0	0	0	0	26.3	24.5	49.2
39	0	--	--	--	--	--	--	--	--
40	4	11,234	0	0	0	0	36.6	10.8	52.6
41	0	--	--	--	--	--	--	--	--
42	2	5,577	0	0	0	0	38.9	32.9	28.2
43	1	2,437	0	0	.1	0	64.5	27.9	7.5
Total or average	92	107,392	0	0	(1/)	(1/)	46.4	16.0	37.6

1/ Less than 0.05 percent.

Table 12.—Veneer grade recovery by scaling diameter, log grade 3, red and white fir

Log scaling diameter (inches)	Number of logs	Veneer volume, 3/8-inch basis	Veneer grade						
			A	A patch	B	B patch	C	C plug	D
		Square feet				*Percent*			
7	1	1	0	0	0	0	100.0	0	0
8	6	366	0	0	0	0	58.4	3.3	38.3
9	22	2,655	0	0	(1/)	0	62.6	1.6	35.8
10	28	4,876	0	0	0	0	54.9	1.0	44.1
11	14	2,882	0	0	0	0	59.2	2.0	38.8
12	15	4,150	0	0	0	0	66.1	0	33.9
13	15	3,942	0	0	0	0	70.2	1.0	28.8
14	9	3,184	0	0	(1/)	0	78.8	.8	20.4
15	12	4,817	0	0	0	0	67.8	1.0	31.2
16	14	7,773	0	0	0	0	69.4	.5	30.1
17	6	3,361	0	0	0	0	41.8	7.9	50.3
18	8	4,743	.3	0	0	0	65.4	2.9	31.4
19	6	4,389	0	0	0	0	58.6	5.7	35.7
20	7	5,363	0	0	0	0	69.9	.6	29.5
21	4	3,416	0	0	0	0	79.4	8.6	12.0
22	8	7,328	0	0	0	0	62.8	9.3	27.9
23	7	7,585	0	0	0	0	28.7	12.1	59.2
24	1	1,199	0	0	.2	0	23.4	0	76.4
25	6	6,251	0	0	0	0	36.2	26.0	37.8
26	2	2,836	0	0	0	0	29.1	13.3	57.6
27	3	4,545	0	0	0	0	80.5	0	19.5
28	1	1,916	0	0	0	0	30.9	0	69.1
29	3	5,517	0	0	0	0	55.4	1.4	43.2
30	0	--	--	--	--	--	--	--	--
31	0	--	--	--	--	--	--	--	--
32	0	--	--	--	--	--	--	--	--
33	0	--	--	--	--	--	--	--	--
34	2	3,526	0	0	0	0	17.3	8.7	74.0
Total or average	200	96,621	(1/)	0	(1/)	0	56.4	5.5	38.1

1/ Less than 0.05 percent.

Table 13.—Veneer grade recovery by scaling diameter, log grade 4, red and white fir

Log scaling diameter (inches)	Number of logs	Veneer volume, 3/8-inch basis	Veneer grade						
			A	A patch	B	B patch	C	C plug	D
		Square feet	*Percent*						
9	1	72	0	0	0	0	18.1	13.9	68.0
10	3	395	0	0	0	0	35.2	0	64.8
11	2	136	0	0	0	0	56.6	0	43.4
12	5	464	0	0	0	0	11.2	0	88.8
13	7	923	0	0	0	0	13.3	0	86.7
14	2	116	0	0	0	0	6.9	4.3	88.8
15	7	1,130	0	0	0	0	24.0	1.1	74.9
16	5	2,335	0	0	0	0	8.8	0	91.2
17	9	3,979	0	0	0	0	6.2	0	93.8
18	5	2,106	0	0	0	0	18.4	.3	81.3
19	8	6,441	0	0	0	0	17.2	2.8	80.0
20	7	5,340	0	0	0	0	7.2	3.4	89.4
21	5	3,669	0	0	.1	0	14.9	.3	84.7
22	6	3,852	0	0	0	0	11.6	1.6	86.8
23	4	3,755	0	0	0	0	12.2	2.9	84.9
24	5	5,323	0	0	0	0	6.0	2.4	91.6
25	7	7,914	0	0	0	0	9.4	1.0	89.6
26	5	6,805	0	0	0	0	13.4	3.2	83.4
27	6	9,905	0	0	0	0	9.4	6.7	83.9
28	3	4,130	0	0	0	0	37.0	.2	62.8
29	10	17,173	0	0	(1/)	0	10.6	6.1	83.3
30	2	2,611	0	0	0	0	10.1	1.6	88.3
31	2	2,909	0	0	0	0	6.3	8.1	85.6
32	4	6,789	0	0	0	0	8.0	.2	91.8
33	5	10,276	0	0	0	0	4.9	8.6	86.5
34	1	2,021	0	0	0	0	4.7	0	95.3
35	2	4,754	0	0	0	0	7.0	4.5	88.5
36	4	8,100	0	0	1.0	0	30.9	11.6	56.5
37	3	6,502	0	0	0	0	4.9	2.8	92.3
38	1	1,944	0	0	0	0	6.6	0	93.4
39	1	2,922	0	0	0	0	9.7	5.6	84.7
40	1	3,066	0	0	0	0	2.8	9.0	88.2
41	0	--	--	--	--	--	--	--	--
42	1	2,979	0	0	0	0	1.6	0	98.4
43	1	3,302	0	0	0	0	9.4	37.0	53.6
44	0	--	--	--	--	--	--	--	--
45	1	3,484	0	0	0	0	30.0	18.8	51.2
Total or average	141	147,622	0	0	.1	0	11.8	5.1	83.0

1/ Less than 0.05 percent.

Table 14.—Veneer grade recovery by scaling diameter, all grades, red and white fir logs

Log scaling diameter (inches)	Number of logs	Veneer volume, 3/8-inch basis	Veneer grade						
			A	A patch	B	B patch	C	C plug	D
		Square feet	*Percent*						
7	1	1	0	0	0	0	100.0	0	0
8	6	366	0	0	0	0	58.4	3.3	38.3
9	26	2,922	0	0	(1/)	0	60.0	1.8	38.2
10	34	5,784	0	0	0	0	53.1	1.9	45.0
11	19	3,506	0	0	0	0	61.3	1.7	37.0
12	24	5,374	0	0	0	0	61.9	0	38.1
13	29	6,456	0	0	0	0	62.2	1.5	36.3
14	14	4,137	0	0	(1/)	0	77.5	.7	21.8
15	26	8,782	0	0	0	0	66.9	.8	32.3
16	24	12,283	0	0	0	0	56.8	.5	42.7
17	22	10,763	0	0	(1/)	0	40.6	3.2	56.2
18	20	11,325	.1	0	0	0	60.5	2.8	36.6
19	19	14,044	0	0	0	0	36.4	6.4	57.2
20	20	14,598	0	0	0	0	44.7	3.6	51.7
21	11	8,915	0	0	(1/)	0	47.6	8.5	43.9
22	18	15,591	0	0	0	0	48.5	7.2	44.3
23	16	16,802	0	0	.2	0	40.1	10.0	49.7
24	8	8,898	0	0	(1/)	0	27.4	3.6	69.0
25	20	20,996	0	0	0	.2	35.1	13.3	51.4
26	11	15,278	0	0	0	0	19.8	10.1	70.1
27	13	19,172	0	0	.1	0	38.2	9.6	52.1
28	7	10,873	0	0	0	0	39.9	7.8	52.3
29	18	30,553	0	0	(1/)	0	32.7	4.6	62.7
30	5	7,840	0	0	0	0	21.7	22.0	56.3
31	9	13,187	0	0	(1/)	0	41.3	8.0	50.7
32	8	14,542	0	0	.5	.3	26.0	17.1	56.1
33	6	12,368	0	0	.7	0	14.0	12.5	72.8
34	5	10,324	0	0	0	0	10.9	10.5	78.6
35	5	11,851	0	0	0	.3	26.9	14.8	58.0
36	7	15,942	0	0	.5	1.1	43.1	19.1	36.2
37	6	14,948	0	0	(1/)	0	23.9	18.2	57.9
38	4	9,915	0	0	0	0	22.5	19.7	57.8
39	1	2,922	0	0	0	0	9.7	5.6	84.7
40	5	14,300	0	0	0	0	29.3	10.4	60.3
41	2	7,208	0	0	.2	4.1	63.3	12.0	20.4
42	4	12,526	0	0	0	0	39.4	19.0	41.6
43	3	9,825	0	0	(1/)	0	59.6	19.3	21.1
44	0	--	--	--	--	--	--	--	--
45	1	3,484	0	0	0	0	30.0	18.8	51.2
46	1	4,129	0	0	0	0	25.6	28.4	46.0
47	0	--	--	--	--	--	--	--	--
48	1	4,178	0	0	0	3.1	55.6	21.6	19.7
Total or average	479	416,908	(1/)	0	.1	.2	38.4	10.0	51.3

1/ Less than 0.05 percent.

Table 15.—Distribution of veneer grade and item by thickness, log grade 1, red and white fir

Veneer item		Veneer grade							Total veneer volume	Below grade veneer volume
		A	A patch	B	B patch	C	C plug	D		
		Percent							*Square feet, 3/8-inch basis*	
Full sheets	1/10 inch	0	0	1	3	46	34	16	10,680	48
	1/8 inch	0	0	0	2	47	38	13	16,468	12
	3/16 inch	--	--	--	--	--	--	--	--	--
Half sheets	1/10 inch	0	0	1	0	64	14	21	3,773	10
	1/8 inch	0	0	0	0	46	8	46	6,645	18
	3/16 inch	0	0	0	0	93	0	7	10,247	9
Random width	1/10 inch	0	0	2	0	63	8	27	4,624	361
	1/8 inch	0	0	0	0	54	5	41	9,178	643
	3/16 inch	0	0	0	0	86	0	14	3,658	146

Table 16.—Distribution of veneer grade and item by thickness, log grade 2, red and white fir

Veneer item		Veneer grade							Total veneer volume	Below grade veneer volume
		A	A patch	B	B patch	C	C plug	D		
		Percent							*Square feet, 3/8-inch basis*	
Full sheets	1/10 inch	0	0	0	0	44	27	29	16,358	231
	1/8 inch	0	0	0	0	26	36	38	25,807	48
	3/16 inch	--	--	--	--	--	--	--	--	--
Half sheets	1/10 inch	0	0	0	0	61	6	33	7,377	20
	1/8 inch	0	0	0	0	36	14	50	14,488	73
	3/16 inch	0	0	0	0	68	0	32	11,314	9
Random width	1/10 inch	0	0	0	0	59	3	38	10,417	924
	1/8 inch	0	0	(1/)	0	52	4	44	16,912	1,429
	3/16 inch	0	0	0	0	80	0	20	4,719	320

1/ Less than 0.05 percent.

Table 17.—Distribution of veneer grade and item by thickness, log grade 3, red and white fir

Veneer item		Veneer grade							Total veneer volume	Below grade veneer volume
		A	A patch	B	B patch	C	C plug	D		
		Percent							*Square feet, 3/8-inch basis*	
Full sheets	1/10 inch	0	0	0	0	47	16	37	10,628	77
	1/8 inch	(1/)	0	0	0	51	12	37	20,087	12
	3/16 inch	--	--	--	--	--	--	--	--	--
Half sheets	1/10 inch	0	0	0	0	32	3	65	5,403	15
	1/8 inch	0	0	0	0	52	6	42	8,411	54
	3/16 inch	0	0	0	0	73	0	27	23,233	27
Random width	1/10 inch	0	0	0	0	43	2	55	9,353	1,162
	1/8 inch	0	0	0	0	55	2	43	11,812	946
	3/16 inch	0	0	0	0	77	0	23	7,694	445

1/ Less than 0.05 percent.

Table 18.—Distribution of veneer grade and item by thickness, log grade 4, red and white fir

Veneer item		Veneer grade							Total veneer volume	Below grade veneer volume
		A	A patch	B	B patch	C	C plug	D		
		Percent							*Square feet, 3/8-inch basis*	
Full sheets	1/10 inch	0	0	0	0	13	12	75	18,758	106
	1/8 inch	0	0	0	0	2	14	84	23,266	48
	3/16 inch	--	--	--	--	--	--	--	--	--
Half sheets	1/10 inch	0	0	0	0	10	3	87	20,272	103
	1/8 inch	0	0	0	0	6	4	90	21,745	180
	3/16 inch	0	0	0	0	15	0	85	9,663	27
Random width	1/10 inch	0	0	0	0	15	1	84	21,123	2,105
	1/8 inch	0	0	0	0	19	1	80	27,443	3,290
	3/16 inch	0	0	0	0	19	0	81	5,352	739

Table 19.—Distribution of veneer grade and item by thickness, all grades, red and white fir logs

Veneer item		Veneer grade							Total veneer volume	Below grade veneer volume
		A	A patch	B	B patch	C	C plug	D		
		Percent							*Square feet, 3/8-inch basis*	
Full sheets	1/10 inch	0	0	0	1	35	21	43	56,424	462
	1/8 inch	(1/)	0	0	(1/)	29	25	46	85,628	120
	3/16 inch	--	--	--	--	--	--	--	--	--
Half sheets	1/10 inch	0	0	0	0	29	4	67	36,825	148
	1/8 inch	0	0	0	0	27	8	65	51,289	325
	3/16 inch	0	0	0	0	66	0	34	54,457	72
Random width	1/10 inch	0	0	0	0	36	2	62	45,517	4,552
	1/8 inch	0	0	(1/)	0	39	3	58	65,345	6,308
	3/16 inch	0	0	0	0	64	0	36	21,423	1,650
Totals									416,908	13,637

1/ Less than 0.05 percent.

APPENDIX B

BLOCKS

Table 20.—Block scale, veneer tally, and cubic volumes by scaling diameter, grade 1 red and white fir blocks

Block scaling diameter (inches)	Number of blocks	Scale		Veneer tally		Volume					
		Gross	Net	Volume, 3/8-inch basis	Recovery ratio	Block	Veneer	Recovery	Below grade veneer	Core	Residue
		Board feet		Square feet		Cubic feet		Percent	Cubic feet		
7	1	10	10	--	0	3.11	0	0	0	0	3.11
8	0	--	--	--	--	--	--	--	--	--	--
9	0	--	--	--	--	--	--	--		--	--
10	1	30	20	16	.80	5.93	.53	8.94	.12	1.92	3.36
11	0	--	--	--	--	--	--	--	--	--	--
12	1	40	30	12	.40	8.99	.40	4.45	.15	1.98	6.46
13	3	150	140	282	2.01	27.83	9.26	33.27	.10	8.77	9.70
14	1	60	40	71	1.77	11.33	2.38	21.01	.42	1.98	6.55
15	1	70	40	144	3.60	11.18	4.77	42.67	.02	1.98	4.41
16	0	--	--	--	--	--	--	--	--	--	--
17	3	270	240	475	1.98	44.85	15.66	34.92	2.17	5.76	21.26
18	1	110	110	323	2.94	14.97	10.72	71.61	.33	1.98	1.94
19	3	360	340	851	2.50	53.78	28.20	52.44	.73	13.34	11.51
20	2	280	250	785	3.14	47.83	25.58	53.48	.29	3.90	18.06
21	1	150	150	233	1.55	26.27	7.51	28.59	.17	2.43	16.16
22	1	170	160	492	3.07	25.69	16.21	63.10	.13	1.92	7.43
23	1	190	190	567	2.98	25.69	18.78	73.10	.59	1.92	4.40
24	3	630	520	1,885	3.63	86.95	62.41	71.78	2.32	6.21	16.01
25	4	920	740	1,957	2.64	130.18	64.31	49.40	1.04	25.73	39.10
26	0	--	--	--	--	--	--	--	--	--	--
27	3	810	740	1,688	2.28	117.78	55.79	47.37	2.52	12.43	47.04
28	2	580	410	1,372	3.35	79.70	45.49	57.08	.37	9.23	24.61
29	0	--	--	--	--	--	--	--	--	--	--
30	1	330	300	873	2.91	54.11	28.87	53.35	.94	1.98	22.32
31	2	720	620	1,447	2.33	99.88	47.84	47.90	5.37	3.84	42.83
32	3	1,110	790	2,492	3.15	166.09	82.28	49.54	1.70	13.32	68.79
33	1	390	340	603	1.77	73.05	19.44	26.61	1.35	12.29	39.97
34	1	400	370	1,108	2.99	55.33	36.70	66.33	.05	1.92	16.66
35	0	--	--	--	--	--	--	--	--	--	--
36	0	--	--	--	--	--	--	--	--	--	--
37	0	--	--	--	--	--	--	--	--	--	--
38	0	--	--	--	--	--	--	--	--	--	--
39	0	--	--	--	--	--	--	--	--	--	--
40	0	--	--	--	--	--	--	--	--	--	--
41	1	640	400	1,368	3.42	104.39	45.14	43.24	.47	9.18	49.60
42	2	1,340	1,240	3,926	3.17	165.54	128.43	77.58	.87	4.14	32.10
43	4	2,800	2,510	7,965	3.17	389.70	259.96	66.71	2.75	9.65	117.34
44	1	740	670	1,375	2.05	99.04	45.41	45.85	4.18	2.23	47.22
Total or average	48	13,300	11,370	32,310	2.84	1,929.19	1,062.07	55.05	29.15	160.03	677.94

Table 21.—Block scale, veneer tally, and cubic volumes by scaling diameter, grade 2 red and white fir blocks

Block scaling diameter (inches)	Number of blocks	Scale		Veneer tally		Volume					
		Gross	Net	Volume, 3/8-inch basis	Recovery ratio	Block	Veneer	Recovery	Below grade veneer	Core	Residue
		Board feet		Square feet		Cubic feet		Percent	Cubic feet		
8	1	10	10	27	2.70	3.88	0.90	23.20	0	1.92	1.06
9	1	20	20	1	.05	4.53	.05	1.10	0	0	4.48
10	0	--	--	--	--	--	--	--	--	--	--
11	5	150	150	283	1.89	28.13	9.28	32.99	.28	9.84	8.73
12	4	160	150	372	2.48	30.53	12.22	40.03	.55	7.86	9.90
13	0	--	--	--	--	--	--	--	--	--	--
14	4	240	230	390	1.70	39.86	12.79	32.09	.97	12.69	13.41
15	0	--	--	--	--	--	--	--	--	--	--
16	2	160	160	382	2.39	23.98	12.54	52.29	0	3.96	7.48
17	3	270	270	851	3.15	43.98	27.97	63.60	.59	5.94	9.48
18	2	220	210	490	2.33	30.99	16.20	52.27	0	5.36	9.43
19	3	360	350	1,030	2.94	52.83	33.62	63.64	1.77	5.88	11.56
20	2	280	280	764	2.73	37.93	24.91	65.67	.56	3.96	8.50
21	2	300	290	966	3.33	45.03	31.94	70.93	1.39	3.90	7.80
22	4	680	670	1,992	2.97	100.60	65.37	64.98	1.09	7.80	26.34
23	5	950	940	2,657	2.83	126.18	86.53	68.58	2.39	9.72	27.54
24	2	420	400	1,159	2.90	56.12	37.35	66.55	.28	8.72	9.77
25	4	920	890	2,528	2.84	126.18	83.12	65.87	1.29	14.48	27.29
26	2	500	460	1,342	2.92	65.83	44.37	67.40	.71	3.90	16.85
27	6	1,620	1,260	3,474	2.76	231.64	114.82	49.57	1.25	39.00	76.57
28	3	870	820	1,487	1.81	118.11	49.21	41.66	3.38	7.27	58.25
29	4	1,240	1,120	3,325	2.97	178.58	109.18	61.14	1.02	12.62	55.76
30	1	330	310	976	3.15	43.34	32.36	74.66	.69	1.80	8.49
31	6	2,160	1,850	5,124	2.77	280.15	168.91	60.29	3.96	15.12	92.16
32	3	1,110	1,040	2,709	2.60	164.24	89.61	54.56	9.19	5.76	59.68
33	3	1,170	1,060	3,050	2.88	161.07	100.96	62.68	1.36	9.32	49.43
34	3	1,200	1,020	3,165	3.10	191.09	103.65	54.24	2.68	7.92	76.84
35	2	880	740	1,974	2.67	156.16	64.49	41.30	2.07	11.16	78.44
36	1	460	420	1,016	2.42	61.62	33.66	54.62	.33	1.86	25.77
37	3	1,530	1,410	3,695	2.62	205.02	121.90	59.46	2.53	6.15	74.44
38	2	1,080	750	1,573	2.10	134.24	51.73	38.54	1.21	11.16	70.14
39	2	1,120	830	2,525	3.04	166.65	83.35	50.02	1.40	11.46	70.44
40	1	600	550	1,492	2.71	80.36	49.14	61.15	.20	1.98	29.04
41	1	640	610	2,056	3.37	78.34	68.11	86.94	.45	1.98	7.80
42	1	670	630	1,269	2.01	74.54	41.85	56.14	1.30	8.28	23.11
43	0	--	--	--	--	--	--	--	--	--	--
44	1	740	660	778	1.18	128.00	25.66	20.05	7.01	10.12	85.21
45	3	2,280	1,950	4,494	2.30	320.48	148.27	46.26	3.02	31.34	137.85
46	1	790	760	2,120	2.79	104.52	70.00	66.97	.11	9.05	25.36
47	1	830	740	2,119	2.86	137.72	70.01	50.84	2.14	3.54	62.03
Total or average	94	26,960	24,010	63,655	2.65	3,832.45	2,096.03	54.69	57.17	312.82	1,366.43

Table 22.—Block scale, veneer tally, and cubic volumes by scaling diameter, grade 3 red and white fir blocks

Block scaling diameter (inches)	Number of blocks	Scale		Veneer tally		Volume					
		Gross	Net	Volume, 3/8-inch basis	Recovery ratio	Block	Veneer	Recovery	Below grade veneer	Core	Residue
		Board feet		Square feet		Cubic feet		Percent	Cubic feet		
8	6	60	60	105	1.75	23.37	3.48	14.89	0.07	13.63	6.19
9	23	460	460	775	1.68	100.95	25.52	25.28	.72	45.31	29.40
10	39	1,170	1,160	1,683	1.45	201.98	55.68	27.57	2.50	75.55	68.25
11	48	1,440	1,440	3,060	2.13	306.39	100.67	32.86	2.48	99.36	103.88
12	46	1,840	1,810	3,983	2.20	338.53	130.97	38.69	3.52	97.82	106.22
13	49	2,450	2,420	5,994	2.48	435.00	197.00	45.29	7.26	100.27	130.47
14	36	2,160	2,140	5,440	2.54	365.43	179.36	49.08	3.38	81.66	101.03
15	36	2,520	2,490	6,631	2.66	406.92	217.85	53.54	2.98	82.58	103.51
16	33	2,640	2,610	7,436	2.85	433.64	244.35	56.35	4.35	72.99	111.95
17	31	2,790	2,680	6,871	2.56	449.54	226.16	50.31	9.39	69.40	144.59
18	23	2,530	2,500	7,017	2.81	381.01	230.50	60.50	6.01	46.34	98.16
19	24	2,880	2,880	8,141	2.83	429.03	267.37	62.32	5.18	47.04	109.44
20	24	3,360	3,200	7,685	2.40	482.80	253.21	52.45	7.78	53.86	167.95
21	19	2,850	2,720	7,726	2.84	416.20	253.72	60.96	3.60	43.64	115.24
22	20	3,400	3,270	9,232	2.82	473.48	302.72	63.94	5.27	52.59	112.90
23	12	2,280	2,080	4,575	2.20	318.34	149.95	47.10	11.93	41.43	115.03
24	15	3,150	3,000	8,647	2.88	434.16	284.24	65.47	3.55	37.04	109.33
25	14	3,220	3,020	7,785	2.58	428.70	256.73	59.88	21.92	36.91	113.14
26	11	2,750	2,540	7,278	2.87	370.61	239.27	64.56	5.98	28.56	96.80
27	12	3,210	2,970	7,744	2.61	429.18	254.68	59.34	3.74	42.12	128.64
28	5	1,450	1,360	3,531	2.60	189.92	114.53	60.30	4.74	20.49	50.16
29	11	3,410	3,050	8,134	2.67	456.71	266.85	58.43	6.22	42.89	140.75
30	10	3,300	2,990	8,723	2.92	428.90	285.38	66.54	6.28	32.20	105.04
31	8	2,880	2,440	6,562	2.69	365.23	216.05	59.15	6.94	34.48	107.76
32	4	1,480	1,380	3,193	2.31	195.83	105.52	53.88	4.09	21.94	64.28
33	2	780	710	1,696	2.39	104.17	55.99	53.75	2.64	6.64	38.90
34	7	2,800	2,550	7,433	2.91	398.60	244.59	61.36	5.76	25.70	122.55
35	5	2,200	2,050	6,208	3.03	291.03	204.80	70.37	3.21	19.62	63.40
36	4	1,840	1,630	4,826	2.96	247.62	158.20	63.89	5.73	20.80	62.89
37	6	3,060	2,710	7,185	2.65	404.91	235.34	58.12	2.03	32.32	135.22
38	4	2,160	2,000	5,571	2.79	273.42	183.85	67.24	5.31	19.43	64.83
39	1	560	510	1,424	2.79	71.49	46.97	65.70	.19	1.98	22.35
40	5	3,000	2,770	7,883	2.85	376.26	259.11	68.86	7.11	26.01	84.03
41	2	1,280	1,170	2,904	2.48	163.34	94.64	57.94	1.62	16.95	50.13
42	1	670	590	1,751	2.97	81.80	57.81	70.67	1.48	1.98	20.53
43	2	1,400	1,270	2,987	2.35	176.86	98.58	55.74	3.96	10.35	63.97
44	0	--	--	--	--	--	--	--	--	--	--
45	0	--	--	--	--	--	--	--	--	--	--
46	1	790	710	2,010	2.83	103.55	66.37	64.09	1.00	7.31	28.87
Total or average	599	80,220	75,340	199,829	2.65	11,554.90	6,568.01	56.84	179.92	1,509.19	3,297.78

Table 23.—Block scale, veneer tally, and cubic volumes by scaling diameter, grade 4 red and white fir blocks

Block scaling diameter (inches)	Number of blocks	Scale		Veneer tally		Volume					
		Gross	Net	Volume, 3/8-inch basis	Recovery ratio	Block	Veneer	Recovery	Below grade veneer	Core	Residue
		Board feet		Square feet		Cubic feet		Percent		Cubic feet	
11	2	60	60	82	1.37	13.07	2.69	20.58	0	8.11	2.27
12	3	120	120	187	1.56	23.73	6.12	25.79	.23	6.39	10.99
13	9	450	430	528	1.23	82.21	17.42	21.19	1.32	37.01	26.46
14	6	360	340	387	1.14	61.83	12.64	20.44	.40	29.29	19.50
15	8	560	550	736	1.34	97.84	23.97	24.50	.84	39.49	33.54
16	13	1,040	990	2,026	2.05	172.01	66.99	38.94	4.59	43.39	57.04
17	11	990	940	1,886	2.01	167.67	62.04	37.00	2.36	41.79	61.48
18	7	770	700	1,161	1.66	117.50	38.12	32.44	4.85	35.39	39.14
19	16	1,920	1,860	4,070	2.19	296.16	133.83	45.19	4.49	53.01	104.83
20	13	1,820	1,820	3,833	2.11	272.76	126.26	46.29	.98	47.10	98.42
21	10	1,500	1,330	2,936	2.21	225.72	96.68	42.83	6.24	35.67	87.13
22	10	1,700	1,490	3,337	2.24	243.60	110.18	45.23	3.89	36.59	92.94
23	12	2,280	2,150	5,475	2.55	315.72	181.18	57.39	4.73	28.16	101.65
24	8	1,680	1,500	3,493	2.33	229.70	115.62	50.34	2.86	33.51	77.71
25	10	2,300	2,230	5,101	2.29	313.03	168.44	53.81	4.72	33.70	106.17
26	10	2,500	2,340	5,671	2.42	330.00	187.38	56.78	5.71	26.26	110.65
27	11	2,970	2,820	7,576	2.69	394.43	248.38	62.97	5.65	35.96	104.44
28	8	2,320	2,180	4,708	2.16	308.54	154.76	50.16	6.27	27.27	120.24
29	12	3,720	3,510	9,048	2.58	511.03	297.80	58.27	11.30	29.61	172.32
30	4	1,320	1,280	3,197	2.50	178.09	105.70	59.35	3.00	8.45	60.94
31	6	2,160	2,010	4,475	2.23	280.25	148.18	52.87	4.98	17.09	110.00
32	6	2,220	2,070	5,136	2.48	296.42	169.74	57.26	4.35	19.65	102.68
33	7	2,730	2,630	6,994	2.66	372.68	231.06	62.00	12.39	16.32	112.91
34	7	2,800	2,580	6,500	2.52	397.69	213.12	53.59	17.03	30.60	136.94
35	2	880	830	2,209	2.66	121.89	72.88	59.79	3.49	11.36	34.16
36	3	1,380	1,320	2,989	2.26	188.62	97.78	51.84	14.08	12.82	63.94
37	5	2,550	2,280	4,302	1.89	303.76	141.03	46.43	21.65	17.11	123.97
38	5	2,700	2,320	5,448	2.35	353.56	179.32	50.72	12.66	24.41	137.17
39	2	1,120	1,020	2,941	2.88	143.00	97.07	67.88	1.80	5.61	38.52
40	4	2,400	2,300	4,838	2.10	304.39	159.99	52.56	3.78	19.11	121.51
41	0	--	--	--	--	--	--	--	--	--	--
42	2	1,340	1,240	3,016	2.43	168.78	99.89	59.18	1.97	6.32	60.60
43	1	700	640	1,638	2.56	83.77	54.24	64.75	.82	1.98	26.73
44	2	1,480	1,380	3,235	2.34	184.79	106.78	57.78	1.76	11.79	64.46
45	1	760	700	1,699	2.43	101.44	56.01	55.21	4.82	4.97	35.64
Total or average	236	55,600	51,960	120,858	2.33	7,655.68	3,983.29	52.03	180.01	835.29	2,657.09

Table 24.—Block scale, veneer tally, and cubic volumes by scaling diameter, all grades red and white fir blocks

Block scaling diameter (inches)	Number of blocks	Scale		Veneer tally		Volume					
		Gross	Net	Volume, 3/8-inch basis	Recovery ratio	Block	Veneer	Recovery	Below grade veneer	Core	Residue
		Board feet		Square feet		Cubic feet		Percent		Cubic feet	
7	1	10	10	0	0	3.11	0	0	0	0	3.11
8	7	70	70	132	1.88	27.25	4.38	16.07	.07	15.55	7.25
9	24	480	480	776	1.62	105.48	25.57	24.24	.72	45.31	33.88
10	40	1,200	1,180	1,699	1.44	207.91	56.21	27.04	2.62	77.47	71.61
11	55	1,650	1,650	3,425	2.08	347.59	112.64	32.41	2.76	117.31	114.88
12	54	2,160	2,110	4,554	2.16	401.78	149.71	37.26	4.45	114.05	133.57
13	61	3,050	2,990	6,804	2.28	545.04	223.68	41.04	8.68	146.05	166.63
14	47	2,820	2,750	6,288	2.29	478.45	207.17	43.30	5.17	125.62	140.49
15	45	3,150	3,080	7,511	2.44	515.94	246.59	47.79	3.84	124.05	141.46
16	48	3,840	3,760	9,844	2.62	629.63	323.88	51.44	8.94	120.34	176.47
17	48	4,320	4,130	10,083	2.44	706.04	331.83	47.00	14.51	122.89	236.81
18	33	3,630	3,520	8,991	2.55	544.47	295.54	54.28	11.19	89.07	148.67
19	46	5,520	5,430	14,092	2.60	831.80	463.02	55.66	12.17	119.27	237.34
20	41	5,740	5,550	13,067	2.35	841.32	429.96	51.10	9.61	108.82	292.93
21	32	4,800	4,490	11,861	2.64	713.22	389.85	54.66	11.40	85.64	226.33
22	35	5,950	5,590	15,053	2.69	843.37	494.48	58.63	10.38	98.90	239.61
23	30	5,700	5,360	13,274	2.48	785.93	436.44	55.53	19.64	81.23	248.62
24	28	5,880	5,420	15,184	2.80	806.93	499.62	61.92	9.01	85.48	212.82
25	32	7,360	6,880	17,371	2.52	998.09	572.60	57.37	28.97	110.82	285.70
26	23	5,750	5,340	14,291	2.68	766.44	471.02	61.46	12.40	58.72	224.30
27	32	8,610	7,790	20,482	2.63	1,173.03	673.67	57.43	13.16	129.51	356.69
28	18	5,220	4,770	11,098	2.33	696.27	363.99	52.28	14.76	64.26	253.26
29	27	8,370	7,680	20,507	2.67	1,146.32	673.83	58.78	18.54	85.12	368.83
30	16	5,280	4,880	13,769	2.82	704.44	452.31	64.21	10.91	44.43	196.79
31	22	7,920	6,920	17,608	2.54	1,025.51	580.98	56.65	21.25	70.53	352.75
32	16	5,920	5,280	13,530	2.56	822.58	447.15	54.36	19.33	60.67	295.43
33	13	5,070	4,740	12,343	2.60	710.97	407.45	57.31	17.74	44.57	241.21
34	18	7,200	6,520	18,206	2.79	1,042.71	598.06	57.36	25.52	66.14	352.99
35	9	3,960	3,620	10,391	2.87	569.08	342.17	60.13	8.77	42.14	176.00
36	8	3,680	3,370	8,831	2.62	497.86	289.64	58.18	20.14	35.48	152.60
37	14	7,140	6,400	15,182	2.37	913.69	498.27	54.53	26.21	55.58	333.63
38	11	5,940	5,070	12,592	2.48	761.22	414.90	54.50	19.18	55.00	272.14
39	5	2,800	2,360	6,890	2.92	381.14	227.39	59.66	3.39	19.05	131.31
40	10	6,000	5,620	14,213	2.53	761.01	468.24	61.53	11.09	47.10	234.58
41	4	2,560	2,180	6,328	2.90	346.07	207.89	60.07	2.54	28.11	107.53
42	6	4,020	3,700	9,962	2.69	490.66	327.98	66.84	5.62	20.72	136.34
43	7	4,900	4,420	12,590	2.85	650.33	412.78	63.47	7.53	21.98	208.04
44	4	2,960	2,710	5,388	1.99	411.83	177.85	43.18	12.95	24.14	196.89
45	4	3,040	2,650	6,193	2.34	421.92	204.28	48.42	7.84	36.31	173.49
46	2	1,580	1,470	4,130	2.81	208.07	136.37	65.54	1.11	16.36	54.23
47	1	830	740	2,119	2.86	137.72	70.01	50.84	2.14	3.54	62.03
Total or average	977	176,080	162,680	416,652	2.56	24,972.22	13,709.40	54.90	446.25	2,817.33	7,999.24

Table 25.—Veneer grade recovery by scaling diameter, block grade 1, red and white fir

Block scaling diameter (inches)	Number of blocks	Veneer volume, 3/8-inch basis	Veneer grade						
			A	A patch	B	B patch	C	C plug	D
		Square feet	*Percent*						
7	1	0	0	0	0	0	0	0	0
8	0	--	--	--	--	--	--	--	--
9	0	--	--	--	--	--	--	--	--
10	1	16	0	0	0	0	50.0	0	50.0
11	0	--	--	--	--	--	--	--	--
12	1	12	0	0	0	0	100.0	0	0
13	3	282	0	0	0	0	38.7	13.1	48.2
14	1	71	0	0	0	0	23.9	0	76.1
15	1	144	0	0	0	0	88.2	0	11.8
16	0	--	--	--	--	--	--	--	--
17	3	475	0	0	0	0	71.5	23.2	5.3
18	1	323	0	0	.6	0	71.2	19.8	8.4
19	3	851	0	0	0	0	90.3	3.4	6.3
20	2	785	0	0	0	0	96.7	0	3.3
21	1	733	0	0	0	0	78.1	0	21.9
22	1	492	0	0	0	0	28.5	69.1	2.4
23	1	567	0	0	1.8	0	42.8	39.0	16.4
24	3	1,885	0	0	1.1	2.0	62.4	25.7	8.8
25	4	1.957	0	0	0	0	58.6	28.0	13.4
26	0	--	--	--	--	--	--	--	--
27	3	1,688	0	0	.7	0	66.6	16.2	16.5
28	2	1,372	0	0	0	0	51.7	40.6	7.7
29	0	--	--	--	--	--	--	--	--
30	1	873	0	0	0	0	58.1	37.9	4.0
31	2	1,447	0	0	0	0	45.0	41.3	13.7
32	3	2,492	0	0	0	0	43.6	32.1	24.3
33	1	603	0	0	0	0	81.1	0	18.9
34	1	1,108	0	0	7.8	0	53.3	36.6	2.3
35	0	--	--	--	--	--	--	--	--
36	0	--	--	--	--	--	--	--	--
37	0	--	--	--	--	--	--	--	--
38	0	--	--	--	--	--	--	--	--
39	0	--	--	--	--	--	--	--	--
40	0	--	--	--	--	--	--	--	--
41	1	1,368	0	0	0	0	45.5	47.4	7.1
42	2	3,926	0	0	.4	7.5	79.0	2.4	10.7
43	4	7,965	0	0	(1/)	0	75.9	14.6	9.5
44	1	1.375	0	0	0	0	61.3	3.0	35.7
Total or average	48	32,310	0	0	.5	1.0	65.1	20.9	12.5

1/ Less than 0.05 percent.

Table 26.—Veneer grade recovery by scaling diameter, block grade 2, red and white fir

Block scaling diameter (inches)	Number of blocks	Veneer volume, 3/8-inch basis	Veneer grade						
			A	A patch	B	B patch	C	C plug	D
		Square feet	*Percent*						
8	1	27	0	0	0	0	92.6	0	7.4
9	1	1	0	0	0	0	100.0	0	0
10	0	--	--	--	--	--	--	--	--
11	5	283	0	0	0	0	82.3	0	17.7
12	4	372	0	0	0	0	76.3	0	23.7
13	0	--	--	--	--	--	--	--	--
14	4	390	0	0	0	0	78.9	2.6	18.5
15	0	--	--	--	--	--	--	--	--
16	2	382	0	0	0	0	83.0	0	17.0
17	3	851	0	0	0	0	60.0	18.1	21.9
18	2	490	0	0	0	0	59.8	0	40.2
19	3	1,030	0	0	0	0	74.1	14.0	11.9
20	2	764	0	0	0	0	79.0	14.5	6.5
21	2	966	0	0	0	0	49.8	18.8	31.4
22	4	1,992	0	0	0	0	40.4	15.9	43.7
23	5	2,657	0	0	0	0	68.9	10.6	20.5
24	2	1,159	0	0	0	0	69.3	0	30.7
25	4	2,528	0	0	0	0	86.3	8.2	5.5
26	2	1,342	0	0	0	0	49.4	44.0	6.6
27	6	3,474	0	0	0	0	57.2	13.3	29.5
28	3	1,487	0	0	0	0	64.0	3.7	32.3
29	4	3,325	0	0	0	0	53.5	19.9	26.6
30	1	976	0	0	0	0	17.5	65.9	16.6
31	6	5,124	0	0	0	0	47.3	3.1	49.6
32	3	2,709	0	0	0	1.8	51.8	25.2	21.2
33	3	3,050	0	0	2.4	0	43.2	37.1	17.3
34	3	3,165	0	0	0	0	59.0	6.7	34.3
35	2	1,974	0	0	0	1.8	57.9	11.2	29.1
36	1	1,016	0	0	8.4	0	54.5	32.1	5.0
37	3	3,695	0	0	0	0	54.6	40.3	5.1
38	2	1,573	0	0	0	0	49.8	38.2	12.0
39	2	2,525	0	0	0	7.1	48.5	39.8	4.6
40	1	1,492	0	0	0	0	47.1	13.6	39.3
41	1	2,056	0	0	0	0	17.3	37.6	45.1
42	1	1,269	0	0	0	0	48.6	14.3	37.1
43	0	--	--	--	--	--	--	--	--
44	1	778	0	0	0	0	70.1	.8	29.1
45	3	4,494	0	0	0	2.4	45.2	25.0	27.4
46	1	2,120	0	0	0	1.1	63.8	7.6	27.5
47	1	2,119	0	0	0	0	44.7	36.9	18.4
Total or average	94	63,655	0	0	.2	.6	53.9	20.2	25.1

Table 27.—Veneer grade recovery by scaling diameter, block grade 3, red and white fir

Block scaling diameter (inches)	Number of blocks	Veneer volume, 3/8-inch basis	Veneer grade						
			A	A patch	B	B patch	C	C plug	D
		Square feet	*Percent*						
8	6	105	0	0	0	0	46.7	9.5	43.8
9	23	775	0	0	.1	0	66.4	4.0	29.5
10	39	1,683	0	0	0	0	61.9	2.3	35.8
11	48	3,060	0	0	0	0	60.5	1.2	38.3
12	46	3,983	0	0	0	0	66.8	1.7	31.5
13	49	5,994	0	0	0	0	66.4	.5	33.1
14	36	5,440	0	0	(1/)	0	72.8	1.2	26.0
15	36	6,631	0	0	0	0	74.0	.4	25.6
16	33	7,436	0	0	0	0	71.7	.6	27.7
17	31	6,871	0	0	0	0	52.8	0	47.2
18	23	7,017	0	0	0	0	68.8	1.4	29.8
19	24	8,141	.1	0	0	0	59.0	3.7	37.2
20	24	7,685	0	0	0	0	57.3	4.6	38.1
21	19	7,726	0	0	0	0	57.2	4.4	38.4
22	20	9,232	0	0	(1/)	0	56.0	6.7	37.3
23	12	4,575	0	0	0	0	52.1	.1	47.8
24	15	8,647	0	0	0	0	42.8	8.6	48.6
25	14	7,785	0	0	(1/)	0	27.6	20.3	52.1
26	11	7,278	0	0	0	0	30.9	11.3	57.8
27	12	7,744	0	0	.1	0	41.7	8.3	49.9
28	5	3,531	0	0	0	0	51.3	0	48.7
29	11	8,134	0	0	0	0	43.3	.7	56.0
30	10	8,723	0	0	0	0	37.2	5.7	57.1
31	8	6,562	0	0	0	0	29.8	13.3	56.9
32	4	3,193	0	0	0	0	17.6	12.3	70.1
33	2	1,696	0	0	0	0	16.5	12.2	71.3
34	7	7,433	0	0	0	0	18.8	6.5	74.7
35	5	6,208	0	0	0	0	18.4	30.2	51.4
36	4	4,826	0	0	0	0	39.6	17.0	43.4
37	6	7,185	0	0	0	0	41.5	21.8	36.7
38	4	5,571	0	0	0	0	25.5	9.8	64.7
39	1	1,424	0	0	0	0	10.7	21.1	68.2
40	5	7,883	0	0	0	0	37.2	12.4	50.4
41	2	2,904	0	0	0	0	62.9	.6	36.5
42	1	1,751	0	0	0	0	24.8	36.6	38.6
43	2	2,987	0	0	0	0	39.5	33.7	26.8
44	0	--	--	--	--	--	--	--	--
45	0	--	--	--	--	--	--	--	--
46	1	2,010	0	0	0	0	5.5	19.4	75.1
Total or average	599	199,829	(1/)	0	(1/)	0	46.1	8.3	45.6

1/ Less than 0.05 percent.

Table 28.—Veneer grade recovery by scaling diameter, block grade 4, red and white fir

Block scaling diameter (inches)	Number of blocks	Veneer volume, 3/8-inch basis	Veneer grade						
			A	A patch	B	B patch	C	C plug	D
		Square feet	*Percent*						
11	2	82	0	0	0	0	46.3	43.9	9.8
12	3	187	0	0	0	0	1.6	0	98.4
13	9	528	0	0	0	0	15.3	0	84.7
14	6	387	0	0	0	0	32.0	0	68.0
15	8	736	0	0	0	0	15.4	0	84.6
16	13	2,026	0	0	0	0	8.7	1.9	89.4
17	11	1,886	0	0	0	0	21.6	.3	78.1
18	7	1,161	0	0	0	0	19.6	.4	80.0
19	16	4,070	0	0	0	0	10.2	5.6	84.2
20	13	3,833	0	0	.1	0	15.4	1.2	83.3
21	10	2,936	0	0	0	0	6.7	.2	93.1
22	10	3,337	0	0	(1/)	0	9.8	0	90.2
23	12	5,475	0	0	0	0	9.1	6.3	84.6
24	8	3,493	0	0	0	0	9.5	3.1	87.4
25	10	5,101	0	0	0	0	10.1	1.9	88.0
26	10	5,671	0	0	0	0	10.8	9.8	79.4
27	11	7,576	0	0	0	0	13.8	2.6	83.6
28	8	4,708	0	0	0	0	10.0	0	90.0
29	12	9,048	0	0	(1/)	0	15.5	4.4	80.1
30	4	3,197	0	0	0	0	9.4	.4	90.2
31	6	4,475	0	0	.1	0	19.0	2.3	78.6
32	6	5,136	0	0	0	0	6.7	.9	92.4
33	7	6,994	0	0	0	0	4.3	9.7	86.0
34	7	6,500	0	0	0	0	10.4	2.5	87.1
35	2	2,209	0	0	0	0	7.4	.9	91.7
36	3	2,989	0	0	0	0	6.5	0	93.5
37	5	4,302	0	0	0	0	2.9	4.2	92.9
38	5	5,448	0	0	0	0	8.3	1.3	90.4
39	2	2,941	0	0	.1	0	16.2	8.8	74.9
40	4	4,838	0	0	0	0	7.4	7.7	84.9
41	0	--	--	--	--	--	--	--	--
42	2	3,016	0	0	0	0	2.5	5.1	92.4
43	1	1,638	0	0	0	0	12.4	12.8	74.8
44	2	3,235	0	0	0	0	3.8	31.3	64.9
45	1	1,699	0	0	0	0	30.0	19.8	50.2
Total or average	236	120,858	0	0	(1/)	0	10.5	4.7	84.8

1/ Less than 0.05 percent.

Table 29.—Veneer grade recovery by scaling diameter, all grades, red and white fir blocks

Block scaling diameter (inches)	Number of blocks	Veneer volume, 3/8-inch basis	Veneer grade						
			A	A patch	B	B patch	C	C plug	D
		Square feet	*Percent*						
7	1	0	0	0	0	0	0	0	0
8	7	132	0	0	0	0	56.0	7.6	36.4
9	24	776	0	0	.1	0	66.5	4.0	29.4
10	40	1,699	0	0	0	0	61.8	2.2	36.0
11	55	3,425	0	0	0	0	62.0	2.1	35.9
12	54	4,554	0	0	0	0	65.0	1.5	33.5
13	61	6,804	0	0	0	0	61.2	1.0	37.8
14	47	6,288	0	0	(1/)	0	70.1	1.2	28.7
15	45	7,511	0	0	0	0	68.5	.4	31.1
16	48	9,844	0	0	0	0	59.2	.8	40.0
17	48	10,083	0	0	0	0	48.5	2.7	48.8
18	33	8,991	0	0	(1/)	0	62.1	1.8	36.1
19	46	14,092	.1	0	0	0	47.8	5.0	47.1
20	41	13,067	0	0	(1/)	0	48.8	3.9	47.3
21	32	11,861	0	0	0	0	44.6	4.4	50.0
22	35	15,053	0	0	(1/)	0	42.7	8.5	48.8
23	30	13,274	0	0	.1	0	37.3	6.4	56.2
24	28	15,184	0	0	.1	.3	39.6	8.8	51.2
25	32	17,371	0	0	(1/)	0	34.5	14.0	51.5
26	23	14,291	0	0	0	0	24.6	13.8	61.6
27	32	20,482	0	0	.1	0	36.1	7.7	56.1
28	18	11,098	0	0	0	0	35.5	5.5	59.0
29	27	20,507	0	0	(1/)	0	32.7	5.4	61.9
30	16	13,769	0	0	0	0	30.7	10.8	58.5
31	22	17,608	0	0	(1/)	0	33.4	9.8	56.8
32	16	13,530	0	0	0	.4	25.1	14.2	60.3
33	13	12,343	0	0	.6	0	19.4	16.3	63.7
34	18	18,206	0	0	.5	0	24.9	6.9	67.7
35	9	10,391	0	0	0	.3	23.6	20.3	55.8
36	8	8,831	0	0	1.0	0	30.1	13.0	55.9
37	14	15,182	0	0	0	0	33.8	21.3	44.9
38	11	12,592	0	0	0	0	21.1	9.7	69.2
39	5	6,890	0	0	.1	2.6	26.9	22.7	47.7
40	10	14,213	0	0	0	0	28.1	10.9	61.0
41	4	6,328	0	0	0	0	44.3	22.7	33.0
42	6	9,962	0	0	.2	3.0	42.4	10.7	43.7
43	7	12,590	0	0	(1/)	0	59.0	18.9	22.1
44	4	5,388	0	0	0	0	28.1	19.7	52.2
45	4	6,193	0	0	0	1.7	41.1	23.6	33.6
46	2	4,130	0	0	0	.6	35.4	13.3	50.7
47	1	2,119	0	0	0	0	44.7	36.9	18.4
Total or average	977	416,652	(1/)	0	.1	.2	38.4	10.0	51.3

1/ Less than 0.05 percent.

Table 30.—Distribution of veneer grade and item by thickness, grade 1 blocks, red and white fir

Veneer item		Veneer grade							Total veneer volume	Below grade veneer volume
		A	A patch	B	B patch	C	C plug	D		
		Percent							*Square feet, 3/8-inch basis*	
Full sheets	1/10 inch	0	0	0	4	52	40	4	8,702	29
	1/8 inch	0	0	0	0	35	58	7	2,718	12
	3/16 inch	--	--	--	--	--	--	--	0	--
Half sheets	1/10 inch	0	0	1	0	73	13	13	3,192	5
	1/8 inch	0	0	0	0	44	27	29	2,847	55
	3/16 inch	0	0	0	0	97	0	3	5,759	--
Random width	1/10 inch	0	0	4	0	65	10	21	3,134	283
	1/8 inch	0	0	0	0	69	4	27	3,758	398
	3/16 inch	0	0	0	0	84	0	16	2,200	102

Table 31.—Distribution of veneer grade and item by thickness, grade 2 blocks, red and white fir

Veneer item		Veneer grade							Total veneer volume	Below grade veneer volume
		A	A patch	B	B patch	C	C plug	D		
		Percent							*Square feet, 3/8-inch basis*	
Full sheets	1/10 inch	0	0	1	(1/)	28	40	31	10,806	143
	1/8 inch	0	0	0	2	45	38	15	14,134	12
	3/16 inch	--	--	--	--	--	--	--	0	--
Half sheets	1/10 inch	0	0	0	0	61	11	28	4,915	10
	1/8 inch	0	0	0	0	51	22	27	7,441	6
	3/16 inch	0	0	0	0	75	0	25	6,754	9
Random width	1/10 inch	0	0	1	0	62	5	32	7,334	621
	1/8 inch	0	0	0	0	69	7	24	9,423	673
	3/16 inch	0	0	0	0	72	0	28	2,848	258

1/ Less than 0.05 percent.

Table 32.—Distribution of veneer grade and item by thickness, grade 3 blocks, red and white fir

Veneer item		Veneer grade							Total veneer volume	Below grade veneer volume
		A	A patch	B	B patch	C	C plug	D		
		Percent							*Square feet, 3/8-inch basis*	
Full sheets	1/10 inch	0	0	(1/)	0	49	10	41	22,491	222
	1/8 inch	(1/)	0	0	0	31	22	47	56,647	48
	3/16 inch	--	--	--	--	--	--	--	0	--
Half sheets	1/10 inch	0	0	0	0	41	1	58	8,730	30
	1/8 inch	0	0	0	0	34	4	62	23,379	120
	3/16 inch	0	0	0	0	75	--	25	31,667	27
Random width	1/10 inch	0	0	(1/)	0	45	1	54	14,812	1,887
	1/8 inch	0	0	0	0	43	2	55	30,450	2,572
	3/16 inch	0	0	0	0	77	--	23	11,653	551

1/ Less than 0.05 percent.

Table 33.—Distribution of veneer grade and item by thickness, grade 4 blocks, red and white fir

Veneer item		Veneer grade							Total veneer volume	Below grade veneer volume
		A	A patch	B	B patch	C	C plug	D		
		Percent							*Square feet, 3/8-inch basis*	
Full sheets	1/10 inch	0	0	0	0	8	13	79	14,425	68
	1/8 inch	0	0	0	0	3	18	79	12,129	48
	3/16 inch	--	--	--	--	--	--	--	0	--
Half sheets	1/10 inch	0	0	0	0	9	3	88	19,988	103
	1/8 inch	0	0	0	0	5	3	92	17,604	144
	3/16 inch	0	0	0	0	14	0	86	10,277	36
Random width	1/10 inch	0	0	(1/)	0	15	1	84	20,237	1,761
	1/8 inch	0	0	(1/)	0	15	1	84	21,476	2,568
	3/16 inch	0	0	0	0	18	0	82	4,722	739

1/ Less than 0.05 percent.

Table 34.—Distribution of veneer grade and item by thickness, all blocks combined, red and white fir

Veneer item		Veneer grade							Total veneer volume	Below grade veneer volume
		A	A patch	B	B patch	C	C plug	D		
		Percent							*Square feet, 3/8-inch basis*	
Full sheets	1/10 inch	0	0	(1/)	1	35	21	43	56,424	462
	1/8 inch	(1/)	0	0	(1/)	29	25	46	85,628	120
	3/16 inch	--	--	--	--	--	--	--	0	--
Half sheets	1/10 inch	0	0	(1/)	0	29	4	67	36,825	148
	1/8 inch	0	0	0	0	27	8	65	51,271	325
	3/16 inch	0	0	0	0	66	0	34	54,457	72
Random width	1/10 inch	0	0	(1/)	0	36	2	62	45,517	4,552
	1/8 inch	0	0	(1/)	0	39	3	58	65,107	6,211
	3/16 inch	0	0	0	0	65	0	35	21,423	1,653

1/ Less than 0.05 percent.

Woodfin, R. O., Jr. and W. Y. Pong
1974. Veneer recovery of red and white fir--California. USDA For. Serv. Res. Pap. PNW-171, 48 p., illus.

Red and white fir grade recovery percentages are presented by short log and veneer block diameter classes. Less than 1 percent of veneer was recovered in A and B grades. Relationships of recovery ratio and square feet or cubic feet of veneer to log volumes are shown.

Keywords: Veneer mill studies, red fir, *Abies magnifica*, white fir, *Abies concolor*.

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The FOREST SERVICE of the U. S. Department of Agriculture is dedicated to the principle of multiple use management of the Nation's forest resources for sustained yields of wood, water, forage, wildlife, and recreation. Through forestry research, cooperation with the States and private forest owners, and management of the National Forests and National Grasslands, it strives — as directed by Congress — to provide increasingly greater service to a growing Nation.